COLONY OF SINGAPORE

MASTER PLAN

REPORT OF SURVEY

COLONY OF SINGAPORE

MODEL SHOWING

OUTLINE

OF

PROPOSALS

OF

MASTER PLAN

INDUSTRY
CIVIC & CULTURAL
CENTRAL AREAS
URBAN AREAS
VILLAGES
NEW TOWNS
MAJOR ROADS

RAILWAYS
DOCK AREAS
AIRFIELDS
GREEN BELT
PUBLIC OPEN SPACE
RURAL AREAS
CATCHMENT AREAS

NATURE RESERVES
SCHOOLS & UNIVERSITIES
WIRELESS STATIONS
H.M. FORCES LAND
AGRICULTURAL LAND
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MASTER PLAN

REPORT OF SURVEY

Published by Authority

Printed at the Government Printing Office, Singapore, by F. S. Horslin, Government Printer.

Price $5 or 11s. 8d.

Written—July to December, 1954

Published—December, 1955

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Diagnostic Survey and Master Plan Team 1952–55

COLONY OF SINGAPORE

MASTER PLAN

REPORT OF SURVEY

CHAPTER ONE

INTRODUCTION

Legal Requirements

1. Section 52A of the Singapore Improvement Ordinance (Cap. 134) requires a diagnostic survey of the Colony to be carried out and, within three years from 1st January, 1952, a report of the survey to be submitted to the Governor in Council together with a Master Plan indicating the manner in which it is proposed that land in the Colony should be used, either by the carrying out thereon of development or otherwise, and the stages by which such development should be carried out. The period of submission has since been extended until December 1955.

2. Responsibility for making the survey and the Plan rests on the Board of the Singapore Improvement Trust. To carry out the survey and prepare the Plan, a Diagnostic Survey Team was appointed and has worked since January 1952, under the general guidance of Sir George L. Pepler, C.B., Town Planning Adviser to the Colony, and the Manager of the Singapore Improvement Trust.

3. The form of the Master Plan is dictated partly by the Singapore Improvement Ordinance and more particularly by the Singapore Improvement (Master Plan) Rules, 1954. The Plan consists of the following:—

(*a*) a *Written Statement* including a summary of the main proposals of the Plan and such descriptive matter as is considered necessary;
(*b*) a *Colony Map* at a scale of 2½ inches to a mile;
(*c*) a *Town Map* at a scale of 8 chains to an inch;
(*d*) a *Central Area Map* at a scale of 4 chains to an inch;
(*e*) a series of *Programme Maps* indicating the stages by which proposed development shown on the Colony, Town and Central Area Maps could be carried out.

4. The preparation of further Maps and Written Statements is foreseen, and these may be submitted to the Governor in Council at a later date as additions or amendments to the present Master Plan.

5. Under the provisions of the Improvement Ordinance, at least once every five years a fresh survey of the Colony must be made and a report on it submitted to the Governor in Council together with such proposals for alterations of and additions to the Master Plan as are considered necessary as a result of the survey.

The Background

6. The Master Plan consists of a series of maps of part or all of the Colony and a Written Statement describing them. But, to appreciate its full significance and its limitations, it is necessary to take a wider view than that of the maps and the Written Statement, and it is for this purpose that this Report of Survey has been written.

7. Singapore is a small island at the southern tip of the Malayan Peninsula with an importance which is out of all proportion to its size. Sir Stamford Raffles foresaw that, because it lies across the main trade routes connecting Europe and India with the Far East and because of its central position in relation to the Indonesian Archipelago, Singapore would become the centre for international trade in South-East Asia. Raffles was right and for nearly 150 years the merchants of Singapore have exploited its advantages and, with the added impetus of a free trade policy consistently maintained from the foundation

of the Colony, have built up a wealth of trading experience which is unrivalled in this part of the world. Raffles thought in terms of trade routes by sea and these are still of predominant importance and account for Singapore's pre-eminence as a port. Today we are witnessing the amazing development of transport by air and for this too Singapore is a nodal point.

8. Although Singapore holds a unique economic situation in relation to trade routes, it has to be remembered that the use of such routes may be affected by other than economic considerations. Moreover, having regard to the rapid expansion of population, the question arises as to whether the future population can be sustained by trade alone, even should it expand.

9. Both these factors have been taken into account by the Diagnostic Survey Team and the Plan is based primarily on the assumption that the economic future of the Colony is, subject to the injection of some new industry, sufficiently assured to enable nearly two million people to live at an adequate standard of living. The fact that this assumption cannot be made without relation to external conditions lays stress on the proposal made elsewhere in this report that consideration should be given to the establishment of a wider regional planning scheme embracing at least the Federation of Malaya and preferably other countries in South-East Asia as well.

Survey and Research

10. This Report of Survey does not form part of the Master Plan: its function is to describe the surveys and research which have been carried out, discuss the results and show how these results, together with other information, have laid the foundation for the proposals of the Master Plan. An explanation of the proposals forms a chapter of this report.

11. The wide scope of the surveys and research is illustrated in the contents of this report. The use of land affects everyone; proposals for its future use must be based on as complete a knowledge as possible of existing conditions and of the trends which indicate what future conditions may be. These conditions and trends have been discovered by survey, research, consultation and discussion.

12. *Field Surveys.*—With the valuable assistance of students and staff of the University of Malaya, the Teachers' Training College, Raffles Institution and other schools, surveys of land use and population have been carried out over a wide area of the Colony. An island-wide traffic census has also been made. The results of these surveys were analysed statistically and mapped. Some of the results are contained in the text and illustrations in this report and others are shown on detailed plans in the possession of the Diagnostic Survey Team. Public co-operation during field surveys was excellent.

13. As stated in paragraph 2, the survey to form the basis of the plan began in 1952. Consequently, in the following list of the principal field surveys carried out, the date of each survey is noted. It will be appreciated that since these dates, changes have taken place, and that is why the Ordinance requires a fresh survey to be carried out at least every five years. The facts derived from this first series of surveys suffice, however, to afford a firm basis for this first plan, which as noted later is mainly related to a 20 year period from 1952, when the surveys were made. The following is a list of the principal field surveys, together with the dates at which they were made:—

(*a*) Land and Building Use Survey —Central Area	July 1952.
(*b*) Land and Building Use Survey —Urban Area	October 1952.
(*c*) Land and Building Use Survey —Rural Area	September 1953.
(*d*) Attap Survey—Urban Area	July 1953.
(*e*) Traffic Census	August 1953.
(*f*) Car Parking Survey—Central Area	June 1953.
(*g*) Industrial Survey	March/April 1953.

14. *Consultation.*—Public and private organisations in the Colony have collected a large amount of valuable information and a number of organisations have made plans for the future. Such information and plans have been made available to the Team and all have been taken into consideration in the preparation of the Master Plan. The proposals of the Plan affect many authorities such as the suppliers of water, gas, electricity and other public utility services, and there has been full consultation with all the authorities principally concerned.

15. *Discussion.*—It would have been presumptuous for the Diagnostic Survey Team to attempt alone to forecast future development in Singapore in all the many fields affected by the Master Plan. Moreover, the success of the Plan depends on its being, as far as resources allow, a synthesis of the aspirations of the people of Singapore. Accordingly, in order to obtain the advice of specialists and those with local knowledge, Study Groups were formed with the cordial assistance of heads of various departments to study problems of population, redevelopment, traffic, and building and industrial resources. The reports of these study groups are contained in a separate volume entitled *Reports of Study Groups and Working Parties*. The principles on which the Master Plan is based are largely those suggested or accepted by these groups, who have been supplied with the facts derived from survey, research and consultation.

16. The following is a list of the Study Groups and Working Parties which have assisted the Diagnostic Survey Team and to which it desires to express its grateful thanks:—

(*a*) Population Study Group;
(*b*) Building Resources Study Group;
(*c*) Industrial Resources Study Group;
(*d*) Traffic Standards Working Party;
(*e*) Redevelopment Working Party.

The Preliminary Plan

17. To aid consultation and discussion and to assess public opinion, a Preliminary Plan was prepared in 1952, based on information then available. Before this could be published, however, it was considered necessary that legislation, in the form of an amendment to the Land Acquisition Ordinance, should be enacted to discourage land speculation as a result of preliminary proposals. The legislation proposed was not passed at that time and the Preliminary Plan could not be published. The opportunity of wide preliminary consultation with the public and of making a more complete assessment of its opinion and desires was therefore lost.

18. At the time of writing (November 1954) the Colony is not yet protected against land speculation as a result of the proposals of the Master Plan. A Bill has now been presented to the Legislature (July 1955).

The Master Plan

19. For the purposes of survey, the Colony was divided into three general areas: rural, urban and central according to the existing use of land. It will be appreciated that in planning it is necessary to deal in a different way with land intensively developed by substantial buildings, land developed less extensively and land unused or used for agriculture. Survey and research confirmed this division into three areas, and it was therefore possible to define their boundaries more accurately in relation to proposed development. They have been called:—

(*a*) Central Planning Area;
(*b*) Urban Planning Area;
(*c*) Rural Planning Area and Islands.

20. In planning for the future, it has been decided to accept the principle of dividing these large areas into planning districts, to the particular local needs of which close attention can be given. An important feature of the Master Plan is its proposal to secure the provision of essential services in each locality on a scale commensurate with the size of the population, and an assessment can only be made if localities are defined. The planning areas have been divided into planning districts as follows:—

(*a*) *Central Planning Area*—Central Planning Districts A to M, divided into numbered precincts (see Map No 3);
(*b*) *Urban Planning Area*—Urban Planning Districts 1 to 16 (see Map No. 2);
(*c*) *Rural Planning Area*—Rural Planning Districts I to XI; North-Eastern Islands; Southern Islands (see Map No. 1).

21. Technical difficulties have prevented each of the planning areas being shown in full on a separate map. The maps referred to in para. 3 above show the following:—

(*a*) *Central Area Map*—Central Planning Districts D, E, G, H, K and L;
(*b*) *Town Map*—Urban Planning Districts 1 to 16; Central Planning Districts A, B, C, F, J and M;

(c) *Colony Map*—Rural Planning Districts I to XI; North-Eastern Islands; Southern Islands.

22. The area shown on the Central Area Map has a particular significance in that it contains built-up areas on which redevelopment is proposed, i.e. the clearance of sites and the erection of new buildings on them. The area shown on the Town Map has a particular significance in that it contains those lands the use of which is related to the metropolis. The area shown on the Colony Map comprises the remaining land in the Colony, which will serve as a reception area for new towns.

23. Proposals of the Master Plan are shown on the Colony, Town and Central Area Maps, described in the Written Statement and summarised in this report. Where practicable, proposals have been related to specific areas of land, but this has not always been possible and certain proposals are shown on the Maps by symbols which indicate that on land in the general locality of the symbol, a particular use is proposed.

Period of the Master Plan

24. The Colony changes, and certain facts gathered in 1952 even now, in 1954, need review. Wise provision has been made for further surveys within five years of approval of the Plan, but change also limits the time which any one Plan can look ahead. The main proposals of this Plan are limited to those likely to be capable of realisation by 1972, and many specific proposals are limited to five years. In considering the main proposals, however, it must never be forgotten that beyond 1972 there is more time, not only for the solution of problems, but for their further growth.

Report of Survey—Review of Contents

25. Following this introductory chapter is one describing the physical characteristics of the Colony and indicating the limitations imposed on the use of land by natural forces. Existing use of land is the result of the growth of the Colony since 1819, and Chapter Three traces this growth in outline. The pattern of settlement of people on the land is discussed in Chapter Four which also describes the surveys of use of land carried out under the direction of the Team. The whole Master Plan is conditioned by the rapid growth of population, the consequences of which are reviewed in Chapter Five, and one of these consequences, the effect on people's means of livelihood, forms the subject of Chapter Six. The serious nature of the housing situation is now well known in the Colony and received the special attention of the Team from the beginning: an appreciation of its present and future extent is given in Chapter Seven. Allied to housing must be the provision of adequate schools, clinics and other community services and these are dealt with in Chapter Eight. Special attention has been paid in Chapter Nine to the problem of providing enough parks, playing fields and other open space in each planning district. Chapter Ten describes comprehensively existing communications by road, rail, sea and air and emphasises particularly the road traffic problem. All the public utility services are reviewed in Chapter Eleven.

26. Chapters Two to Eleven are a summary of the elements affecting use of land in the Colony, the aim being to place facts together in context so that their relationship to each other and to land use may emerge clearly.

27. The main proposals of the Master Plan are set out and discussed briefly in Chapter Twelve. They are advanced as a practical solution to the problems emerging from the facts presented in Chapters Two to Eleven. Available resources of land, labour, materials and finance are discussed in Chapter Thirteen and related to the proposals of the Master Plan.

28. This is the first Master Plan for the use of land in the Colony of Singapore. In the three years of its preparation, the Diagnostic Survey Team has attempted to assess accurately the needs of the Colony and relate them to the land available and suitable for development. As in all plans for the future, it has been necessary to estimate, but by survey, research, consultation and discussion the Team has tried to find the firmest possible basis for estimation.

29. Because it is a plan for the future, which can only partly be foretold, the Master Plan is not inflexible and its provisions are capable of adjustment to changing circumstances. The main object of the Plan is to secure that the right land shall be available at the right time to meet the variety of needs of the people of Singapore for homes, workplaces and recreation; thereby facilitating the development of the energy and enterprise which is their characteristic.

CHAPTER TWO

PHYSICAL CHARACTERISTICS

Physical Background

30. Singapore Island has an area of 224.5 square miles. It is the southern culmination of the Malayan peninsula and is connected with the mainland by a causeway across the Johore Strait. It is comparatively low lying, and the summits of its hills do not generally exceed 500 feet in height. Mangrove swamps obscure much of its coastline, particularly on the west, and extend inland on the banks of its large tidal estuaries. The city occupies an area in the south-east quadrant of the Island, where deep water facilities are available for the docking of ocean-going ships and the handling of cargo.

31. Geologically, the Island is divisible into three sections, each with its own distinctive type of topography. The western section, geologically the oldest, is mainly composed of sedimentary rocks that were laid down in shallow water during early Mesozoic times; apart from the existence of wide estuaries which penetrate further inland than elsewhere on the Island the terrain in this western part is dominated by ridges of low hills with N.W.-S.E. trend. The central section is composed of granites and allied igneous rocks that forced their way upwards into the older rocks during late Mesozoic times and which, through being resistant to erosion, now provide a more hilly landscape than is found elsewhere on the Island; the highest points of the Island occur in this central section, which also contains most of the workable granite deposits. The eastern section, geologically the youngest, was until fairly recently (in geological time) the floor of a great river system upon which alluvial sands, gravels, and clays were deposited; the level of the Island has since been raised by at least 100 feet, and small streams have incised deep valleys in the beds of the eastern section leaving irregularly distributed groups of low hills, none exceeding 140 feet in height.

32. Singapore Island is surrounded by several small groups of islands, the topography of which varies with their position off the coast. Pulau Ubin, the largest, is composed of granite rock and contains low hills rising out of swamps; Blakang Mati is a continuation of the ridge of hills above Pasir Panjang, whilst the Merlimau group on the S.W. are low-lying.

Geology: Subsoil Conditions

33. In Singapore, subsoil conditions vary considerably from place to place, and a close study is necessary in the choice of suitable building land. There is a thick cover of recent deposits over the solid geology, and this is an important factor in determining both subsoil conditions, types of soils, and the nature of terrain. The Team was fortunate in obtaining the advice of Dr. F. E. S. Alexander on subsoil conditions generally upon the Island, and the following statement was agreed prior to her departure for Nigeria in 1952:

> "*Western Section.*—The load bearing capacity of the rocks in this area is generally good, but experience in the Telok Blanga—Pasir Panjang areas shows that erosion takes place very rapidly indeed. Experience has shown that the speed and extent of the erosion on hill slopes cannot be exaggerated. The soil layer is extremely thin, and the removal of the cover of vegetation leads almost immediately to the exposure of the subsoil. Under the influence of the atmosphere the subsoil and parent rock soften very rapidly, and sheet erosion and gulleying can start in a matter of days. Once this weathering and erosion has started it is extremely difficult—and in some cases impossible—to stop it. Great care must be exercised in developing steep slopes and even gentle slopes must be protected by an overlay and close cover of vegetation; spaced turfs simply aggravate gulleying. The valley bottoms are swampy and contain blue clay and peat which is probably less than 40 feet deep. All valley sites need a thorough bore investigation.
>
> *Central Section.*—The northern part is on heavily weathered granite which has a good load bearing capacity and is less subject to erosion than the sedimentaries on the west. Nevertheless, care must be taken when developing sloping sites. The mangrove swamps bordering the area contain a fluid clay to a depth of 11 feet in places, and the valleys may be difficult to develop because of the occurrence of this clay. Slipping may occur on the junction between the granite and the older alluvium of the east. All land above 25 feet in elevation is comparatively safe for building purposes, apart from the

possibility of meeting core boulders. The city itself lies mainly upon the sedimentaries. Development upon the west side, in the valleys of Sungeis Alexandra, Namli and Ayer Rajah is likely to need careful site preparation.

Eastern Section.—Conditions may be extremely variable on the older alluvium. The alluvium itself contains layers which have been cemented to form an extremely hard rock which can only be excavated by means of explosives. The rock softens rapidly on exposure to the atmosphere. All valleys contain beds of blue clay and unconsolidated sand. In the Paya Lebar area the load bearing capacity may be quite good on the upper hills, but elsewhere valley clays will cause difficulty."

34. In conclusion, Dr. Alexander stressed the need for adequate geological investigation of *all* possible building sites upon the Island.

Economic Geology

35. *Granite.*—This is extracted in the central part of Singapore Island and on Pulau Ubin, a detached intrusion of igneous rock. New quarries could be sited at heights of 200 feet or above on the Island and 100 feet or above on Pulau Ubin: below this height, the depth of the overburden is liable to be considerable. Dr. Alexander has estimated that the granite resources of the Colony in 1950 were 194.8 million cubic yards, which, according to the Building Resources Study Group, should meet Singapore's requirements for a very long time. There are no particular technical difficulties involved in the extraction of this granite.

36. *Sand.*—This material is present in huge quantities on the east side of the Island. Much of it is ill-sorted and contaminated with clay and requires careful washing before it can be used for high grade concrete. Again, no difficulties are involved in its extraction. In Pulau Tekong Kechil, there are deposits of fine sand which are to be extracted for glass making.

37. *Brick Clays.*—The red shales of the sedimentary series on the west side of the Island yield a good brick clay which is also suitable for earthenware in places. The soils in the Huat Choo area of Jurong Road are heavily leached, and provide a white clay (largely kaolin), which is suitable only for coarse earthenware and bricks. These clays are extracted from hillsides and are available in considerable quantities.

38. *Other Minerals.*—Various other deposits are present, but, so far as can be ascertained, none in sufficient quantities to merit commercial exploitation.

Soils

39. The soils of the Island vary from the light sands of the east to the heavy lateritic "clays" of the west. The hillsides are subjected to constant erosion, and the soil cover is invariably thin: the valleys contain the most promising farming soils, particularly if the water table is high. Some of these valley soils are of moderate fertility, some are infertile, but in most cases their productivity may be greatly improved by skilful and intensive farming methods, by the application of suitable fertilizers and by careful irrigation. The soils of the west and centre are more susceptible to improvement by such methods than the drier soils of the east, but low-lying land everywhere, including that in the estuaries, is potentially suitable for intensive cultivation, provided always that the cost of bunding is not excessive. Upland areas are often farmed for cassava and have more recently been used for poultry farming, but this may take place almost anywhere upon the island. Thus, it is unlikely that land which is pre-eminently suitable for building purposes is also of great value agriculturally. This matter is dealt with further under agriculture. (See Chapter Six.)

Climate

40. The main facts of Singapore's climate are well known. The average rainfall is slightly less than 100 inches a year, which is well distributed throughout the year with a maximum occurring either in December or January. Most of this rainfall comes in the form of intensive rain storms which are often very local, and cause an extremely rapid run off. Unless adequate drainage is provided, flooding may result in low lying areas. Both diurnal and annual ranges in temperature are small; the extremes recorded are 70°F and 93°F. Humidity is high and is usually not much below 80 per cent at midday. Local air movements are of greater importance than prevailing winds and are, from place to place, extremely variable in direction and intensity. These movements are often turbulent in character, their direction sometimes being determined by local topography—particularly if it is steep. Near the coasts, the main air movements take the form of land and sea breezes. Finally, there is great intensity of sunshine, and even cloudy skies are bright.

These facts have been borne in mind in the preparation of the Master Plan, and the Report of Survey envisages a future island-wide plan for land drainage. The facts are, however, of particular importance with reference to detailed layout and siting and design of buildings and the architects of the Singapore Improvement Trust have, by continual experiment over a number of years, built up a good deal of information about the best types and designs of dwellings for hot humid climates.

Water Supply

41. In spite of a high annual rainfall, Singapore is short of fresh water. This is because there is a high evaporation rate, much of the run-off flows into the large tidal estuaries and cannot be tapped, and the character of the sub-soil is such that over most of the Island there is no retention of water in natural underground reservoirs.

42. An area of some 7,500 acres, about one-twentieth of the area of the Island, sited approximately in its centre, has been developed for the supply of water by creating three impounding reservoirs in the main valleys draining the watershed. Surface water only is impounded and it is considered that there is little loss through underground seepages. These reservoirs supply 17 of the 45 million gallons per day consumed in Singapore and Johore Bahru, approximately equal to the supply obtained from a similar catchment in the mainland State of Johore, the balance coming from Tebrau River, also in Johore.

43. On the east side of the Island the work of sinking wells in an endeavour to obtain water from underground sources are being put in hand but, even with the water expected to be obtained from this area, the total requirements of Singapore will not be found on the Island. This fact was appreciated by the City Council more than thirty years ago and resulted in the development of the catchment on the mainland. This latter development was completed before World War II and the increasing post-war demands for water are being met from river sources.

CHAPTER THREE

HISTORY AND GROWTH

44. Proposals for the future use of land in Singapore must be based not only on knowledge of existing conditions but also an appreciation of how those conditions arose. The following is a short and selective history of past conditions.

Foundation of Modern Settlement

45. The modern settlement was founded in 1819 by Sir Thomas Stamford Raffles following a search for a trading station in the track of the China trade, providing safe anchorage and capable of defence and of affording protection to sea-going traders against rampant piracy. Although at Raffles' discovery the settlement consisted of only a few hundred persons, there is possible evidence of a considerable earlier history under Hindoo, Buddhist and Moslem influences, and Raffles referred to his settlement as on "the site of the ancient maritime capital of the Malays (its) walls raised not less than six centuries before."*

46. Under Raffles' direction, the population of the town grew at a considerable pace, his own estimate in 1823 being 10,000 persons. Although Singapore was not ceded to Britain until 1824, Raffles in 1822 laid down firm lines for the development of the settlement. The main principles of his edict of 4th November, 1822, may be summarised as follows:—

(*a*) "That there should be the utmost possible freedom of trade and equal rights for all, with protection of property and person."

(*b*) "That the advantages of Singapore should be available to all who are competent to avail themselves of them in proportion to their relative importance and claims to consideration."

(*c*) That, in allocating lands, first preference should be given to merchants, second to artisans and third to farmers.

(*d*) That the separate nationalities and provincial groups should inhabit distinct areas of the town.

(*e*) That the sea front and other commanding sites should be reserved for Government, in particular the Padang, Empress Place and Fort Canning.

(*f*) That the planning of the town should take into account the future increase of population and the nature and occupation of the inhabitants.

47. Not all these principles, laid down more than 130 years ago, are applicable today, but they show astonishing foresight and the rapid and confident growth of Singapore owes much to their author.

48. Plans for the future settlement foretold many aspects of modern Singapore: the road system was to be of "grid-iron" pattern and street frontages were to arcaded to provide a covered footway: markets were to be sited centrally and land for burial grounds was to be reserved. Raffles Place (formerly Commercial Square) was reserved for merchants, the Sultan's precinct for Arabs and the area south of Singapore River for Chinese. The Malays, being engaged in fishing and agriculture, settled outside the urban area.

49. The development of the City has been accompanied by changes in the pattern of settlement in relation both to race and occupation. The flow of immigrants fostered by economic prosperity filled the centre of the City to overflowing and encouraged the spread of the outskirts. European and other leading inhabitants first settled in the Bras Basah Road area, but increasing congestion caused them to move out to the fringes of the City. The distinct racial and provincial groupings decided by Raffles could not stand against the pressure of overcrowding, and social structure became complex. Barriers of race and language tended to subside because of the need for constant contact in a trading community, but because the proportion of immigrants not only remained high but continued to increase, and because such immigrants were predominantly Chinese, there do remain racial groupings of a general nature, e.g. the so-called "Chinatown" south of the Singapore River.

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*Memoirs of Sir Thomas Stamford Raffles—Vol. II (1835), p. 16.

50. Whilst every major city in the world has its slum areas, the extent of the deterioration of the central areas of Singapore and the general inadequacy of community services might possibly be related to the high proportion of immigrants, the stimulus for whose movement is primarily the hope of economic gain. Where there is no firm intention of establish roots, there is less interest in the betterment of the community. The diminution of the migrant flow and the steady growth of a Singapore-born population should presage a new era in the development of a settled community in Singapore.

Constitutional History

51. When Raffles founded Singapore, it was under the control of the British East India Company, and was quickly appropriated by the Government of Bengal. United with Malacca and Penang in 1826 as an Indian Presidency, it was restored to Bengal in 1830. The all-India government established in 1858 took over Singapore until 1867 when the Straits Settlements, of which Singapore was one, secured separation as a Crown Colony. This prevailed until the end of World War II when Singapore became itself a separate Crown Colony.

Land Tenure

52. The remote control of the settlement's affairs from India, the changes in control and a local land administration unable to keep up with events, made a chequered pattern of land tenure on the Island, and the following types of holding now exist:—

(*a*) freehold grants (free of quit rent);

(*b*) statutory grants (subject to surrender on partition and to re-assessment of quit rent every 30 years);

(*c*) 999 year leases;

(*d*) 99 year leases;

(*e*) leases for other terms.

53. The holdings in categories (*a*), (*b*) and (*c*) generally date back to before 1850, and the sizes of lots therefore relate to conditions at that time. Those lot-sizes do not allow modern standards of good development and the oldest lots are naturally, and unfortunately, in the central and most important part of the City. Where leases have, however, reverted to the Crown, amalgamation can be secured.

Physical Growth

54. The accompanying plan (Map No. 4) shows in outline the growth of the City. Barriers which have hitherto restricted growth are hills and swamps; the former, where not reserved for Government, have been used often as burial grounds. Reclamation of swamp and sea has been a feature of development in Singapore, especially near areas where increasing prosperity has raised the price of good building land. Post-war years have seen much of the City's vacant lands developed, especially by the Singapore Improvement Trust in its efforts to provide urban homes.

55. The character of "permanent" development has been decided by many factors. A combination of old building methods and land of poor load-bearing capacity kept City buildings low while local prosperity raised land values and caused lot-sizes to diminish. The flood of immigrants progressively increased congestion in the urban areas and, to accommodate them, the "cubicle", feature of China's cities, was adopted. Too many of the urban population still inhabit these warrens of tiny room-sections, each a few feet square.

56. Even with acute overcrowding, the masonry of the City could not accommodate all the people and many families erected temporary plank-and-attap huts on land not their own. Encroachment on vacant land has always been a feature of this City with its rapidly increasing population and a lagging building rate. With the high birth- and low death-rates now prevailing and the failure of permanent building to keep pace, the growth of "attap" areas is now a major social problem.

57. Against the background of the old, congested parts of the City, however, stand many fine buildings, some the legacy of Singapore's fine Public Works' tradition, and others the evidence of the prosperity and confidence which have inspired almost all the Colony's history.

58. Of increasing importance in relation to the growth of the population are the rural areas of the Colony. First developed by plantations, these areas have maintained the nuclei of many villages, most of which are joined by a system of good roads. Traditional fishing industries have raised settlements around the coast, but the main centres of rural

population have grown in comparatively recent times around H.M. Forces installations, along the arterial route connecting Singapore City with the mainland and at junctions of the road system.

59. Since further extensive permanent building in or near the City must either add to the urban sprawl or be preceded by redevelopment or reclamation, it seems natural to look first to the rural areas for a solution to the most pressing problem of the Colony, viz. the accommodation of the rapid growth of the population.

CHAPTER FOUR

PATTERN OF SETTLEMENT

60. In Chapter Two, the physical characteristics of the Colony have been described and in Chapter Three a short account of its history and growth has been given; in this chapter are discussed the purpose, method and results of the surveys which have been made to find the existing pattern of settlement. The primary object of the Master Plan is to "indicate the manner in which land in the Colony should be used" and a principal purpose of these surveys was to determine how land was being used at the date of survey.

61. The pattern of settlement on Singapore Island radiates from its southern apex where the original settlement was founded and where the centre of the modern city now stands. Between Keppel Harbour and the Kallang River lies a stretch of coastline some 4 miles in length, where land has been developed with extreme intensity to a depth of about a mile. Within this area live more than a third of the Colony's whole population and here also lie the City's business centre, its government buildings, its godowns and its principal shops. The entire civil transport system is also focussed here, with the roads radiating fan-like, the railway heading north for the mainland, shipping lying in the docks and roads and the international airport (soon to be removed to Paya Lebar) sited on the east side of the Kallang estuary.

62. Enclosing this congested area is a larger, less intensively developed urban zone extending inland about 4 miles from the sea and stretching east and west along the coast. Building has taken place along the lines of radial roads and 'in-filling' has followed the construction of ring-roads connecting the radials. Whilst a large part of this urban area is heavily populated and closely built, it also contains most pleasant residential suburbs. Most of the urban zone is within the City Limits.

63. Fishing and agriculture have been responsible for the foundation of small settlements around the coast of Singapore Island and in the hinterland. In the rural areas of Singapore, settlement is mainly scattered, taking the form of small farmsteads. Village centres are spaced out along the main roads, but in most cases these comprise no more than a group of shops, and serve as collection centres for local produce. At major traffic junctions—particularly along Bukit Timah Road—small towns have sprung up, and industrial development has also been attracted.

64. The largest concentrations of population and development outside the City are to be found in and around H.M. Forces installations at Alexandra, Changi, Seletar, Tengah, Sembawang and the Naval Base. Of comparatively recent origin, these settlements attract a considerable working population and have been indirectly responsible for many improvements in the road system. H.M. Forces installations occupy about a tenth of all land in the Colony.

65. Between the settled urban and agricultural areas, there are large tracts of swamp and scrub. The only significant stretch of jungle in the Colony is the water catchment area occupying 12 square miles in the centre of the Island.

Use Surveys

66. The land and building use surveys embraced the whole of the Colony, but differed in kind according to the type of area being dealt with, as follows:—

(*a*) *Land and Building Use Survey in the Central Areas.*—The survey covered land lying at the centre of intensively developed areas. The Singapore Improvement (Master Plan) Rules, 1954, state that in the Master Plan any such land may be defined as a Central Area: the present Master Plan defines only one such area to the North and South of the mouth of the Singapore River. Further surveys of Central Areas will be necessary.

(*b*) *Urban Use Survey.*—This survey covered land predominantly urban and suburban in character, but not so intensively developed as Central Areas.

(*c*) *The Rural Survey.*—This survey covered rural and agricultural land in the remaining areas of the Colony.

67. The areas of survey broadly coincide with the three areas for which proposals have been shown in:—

(*a*) the Central Areas Map,

(*b*) the Town Map, and

(*c*) the Colony Map.

Central Areas Survey

68. The survey of the Central Areas carried out in the summer of 1952 was made in considerable detail. After a pilot survey had been carried out, a detailed enquiry was made into the use and condition of land and buildings in the Central Areas of the City where it was judged problems of redevelopment might arise. (See Map No. 8.) Over 15,000 properties were entered. During the course of the survey the following facts were obtained:—

(*a*) use of each part of each building and piece of land;

(*b*) night-time population of each building in terms of men, women, children and families;

(*c*) nature of residential accommodation;

(*d*) method of sanitation of buildings;

(*e*) notes on type and condition of building structure.

69. From this information, survey maps and tables were prepared showing the quantities of each use in terms of floor space, the predominant use of each building and of blocks, and the density of population.

70. This survey information has been supplemented by other facts readily made available by public authorities and private organisations and by further surveys and research by the Team in other directions, e.g. industry and commerce. The facts have been made available to the Redevelopment Working Party, whose report is contained in *Reports of Study Groups and Working Parties*. It is relevant to quote here from the report of the Redevelopment Working Party their summary of the main problems in the Central Areas:—

(*a*) *Residential Overcrowding.*—The existing amount of residential floor space in buildings in Central Areas is inadequate to house the present population at reasonable standards of living, and the population is increasing at a rate greater than that at which new dwellings are being built.

(*b*) *Open Space and Community Services.*—The present provision of public open spaces, schools, clinics and other community services is below that considered adequate for health and reasonable standards of living.

(*c*) *Dilapidation.*—A considerable amount of property is at or beyond the end of its useful life, dilapidated and insanitary.

(*d*) *Land Values.*—The prosperity of the Colony is such that land values throughout the Central Areas are high and changes in ownership are therefore likely to be initially expensive.

(e) *Land Ownerships.*—The average sizes and shapes of lots in individual ownerships are such that adequate development at modern standards is difficult without the co-operation of owners of adjacent lands.

(*f*) *Use of Land and Buildings.*—Whilst pressure of population has enforced predominantly residential use of many areas, this use is mixed with a number of commercial and industrial activities which are unsuitable in proximity to home life.

(*g*) *Road Traffic.*—The existing pattern of road communications is inadequate for modern needs, particularly in relation to through traffic and access to the heart of the City.

(*h*) *Car Parking.*—Facilities for the parking of cars are inadequate and street-parking aggravates the problem in (*g*) above.

71. Proposals to deal with these problems are discussed in Chapter Twelve of this volume, are listed in the Written Statement, and are shown on the Central Area Map. The extent and grave nature of the problems indicate that considerable changes in the pattern of settlement are required.

Surveys of the Urban Area

72. Three surveys of the existing urban and suburban area have been carried out as follows:—

(*a*) *Use survey* during which the predominant use of each building and plot of land in 1952 was recorded;

(*b*) *Vacant sites survey* when all land vacant at the date of survey (mid-1952) was recorded;

(*c*) *Survey of attap areas* in and near the City, during which details of population, use of buildings and location of huts were recorded. (See Chapter Six).

73. The most important feature of these surveys is that they show that there is land available within a reasonable distance of the City's centre on which some at least of the planning problems of the whole urban area may be solved. There is increasing pressure on this land and the need for a plan to co-ordinate development is nowhere more urgent than in the urban area.

74. The problems to be solved here do not all arise in the urban area itself, but also in the central and rural areas. Particularly is this so with road communications, and the provision of new routes and the improvement of existing roads in the outer urban area will do a great deal to alleviate general traffic difficulties. But the principal contribution of this area is land for housing and ancillary services, well sited and well laid out, with places of work nearby; coupled with this contribution is that of land for open space, particularly school playing fields, of which there is a general deficiency.

75. Proposals to deal with these problems are discussed in Chapter Twelve of this volume, are listed in the Written Statement, and are shown on the Town Map, the coverage of which has been so chosen that it contains all existing development related directly to the City, together with those areas of land, either vacant or occupied by temporary building where further development related to the City is likely to take place. In general, it is proposed to preserve the existing pattern of permanent settlement, to reserve land around the urban area as a "green belt" (see Chapter Nine, paras. 225-226) and to develop the remaining land in cohesive communities, each with reasonable provision for homes, work and play. The implementation of these proposals would be severely limited without a positive policy of resettlement of attap dwellers.

Rural Survey

76. The feature which overshadows all others in the future planning of Singapore is the rapid increase in population and its relationship to the limited area of land in the Colony. The Central Area survey has shown that area to be greatly overpopulated and the Town Map area survey has shown that the amount of land available for further urban development near the City is limited. Any survey of the remainder of the Colony must therefore be directed in part towards determining the suitability of land for development to meet needs which cannot be met in and near the City. The further purposes of the Rural survey were to obtain a record of the use of land at the date of survey, to examine the community life in the various settlements and to discover the nature and extent of deficiencies in social, community and public utility services, which form the main problem in respect of existing development.

77. In this, as in all the other surveys, the Team has been grateful for the amount of information already collected by public authorities on previous surveys. The use of topographical maps and aerial photographs considerably reduced the amount of land which field surveys had to cover, and advice on agriculture from the Department of Commerce and Industry was very valuable.

78. Proposals to deal with the problems referred to above are contained in Chapter Twelve of this volume, are lisited in the Written Statement, and are shown on the Colony Map. In general, it is proposed to encourage the growth of existing settlements and to establish a number of new urban settlements to accommodate large sections of the Colony's population. These proposals will be facilitated by the improvement of communications.

Other Surveys

79. The results of the Central Area, urban and rural surveys have been supplemented by other information dealing with subjects rather than with areas of land. A volumetric traffic count of vehicles on all the Island's main roads and on many minor roads was

made in August 1953; surveys of industrial and building resources were made in March 1953 and November 1952 respectively and studies of the results of these surveys and of population (based on the 1947 population census) have been made by groups representative of wide interests. The reports of these groups are contained in the companion volume entitled *Reports of Study Groups and Working Parties*.

80. From the deliberations of these groups and from the information and schemes of public authorities like the Education and Health Departments, a detailed picture of the existing pattern of settlement has been obtained and proposals for its improvement have been made. Such proposals, being based on as wide as possible a knowledge of existing modes of life, attempt to preserve all that is good and fulfil the aspirations for the future of the greatest number of the people of this Colony.

CHAPTER FIVE

POPULATION

81. In the preceding chapter (para. 76), it has been stated that "the feature which overshadows all others in the future planning of Singapore is the rapid increase in population and its relationship to the limited area of land in the Colony." In this chapter, the whole question of population is discussed.

82. The high birth rate in Singapore is at present uppermost in people's minds as the main cause of population increase. Yet this is a comparatively recent trend. Prior to World War II, although the birth rate was fairly high its importance was eclipsed by population changes due to migration.

83. The present size of the population of Singapore is due mainly to its immigrant peoples. Diagram I illustrates this statement; it shows that in the 130 years since its foundation Singapore has grown from a small Malay settlement of 2,000 people to colony of 1¼ million, and, during this period, the proportion of immigrant people has risen steadily.* The Chinese now represent some 78 per cent of the total population, and the Indians a further 8 per cent. Another way of stressing this aspect of the population growth is to point out that the non-indigenous stock now outnumbers the indigenous to the extent of 88 to 12.

84. Before World War II, there was almost complete freedom of movement between countries of the Far East, and the migratory flows reflected the reactions of the different peoples to varying economic and political circumstances. The greatest of these movements was undoubtedly that of the Chinese into the Nanyang, or South Seas, and according to recent estimates there are now some 10 millions living in the countries of South-East Asia. The recurrence of famine, drought and warfare in China provided a strong motive for emigration, but a movement on this vast scale could never have taken place had not the expanding economies of South-East Asia also held out promise of economic betterment. The influx of Indians from the West, and the comparatively local movement within South-East Asia, particularly from Java to Malaya and elsewhere, were all similarly impelled by motives which were mainly economic. Malaya and Singapore took their share of these migrants.

85. Since World War II, the scene has changed. The free movements of peoples has been largely curtailed. In Singapore, this has become a period of consolidation, and one in which the rapid natural increase of the population is assuming an increasing importance. The rate of reproduction of the population is now so high, and the population structure such, that natural increase has taken the place of immigration as the means of population growth. Even more significant is the fact that the rate of population growth is not slackening. Whereas prior to the second World War, population movement was to a large extent conditioned by economic circumstances, at present and in the near future the economic factor cannot be expected to exert its influence so readily.

86. More and more pressure upon the economic resources of the Island is therefore likely to result from this rapid increase in population. It is the present and future which will be discussed mainly in this Report of Survey: for a fuller appraisal of past trends, the reader is referred to the report of the Population Study Group in the companion volume *Reports of Study Groups and Working Parties.*

Migration

87. *Past and Present Trends.*—As stated above, the migrational flow before the war was enormous. The peak during the 1930's was reached in 1937, when some 760,000 people moved into Malaya from foreign ports and 490,000 moved out. After 1938, an inward monthly quota for the Chinese of 500 men and 500 women was imposed but, in spite of this, in 1940 some 307,000 people came in and 315,000 went out. Comparable figures for 1953 are 102,000 and 103,000, and about 30 per cent of these totals represents the movement of Europeans both in and out of Singapore.

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*For various reasons, the "base date" for population purposes in the Master Plan was taken to be the 30th June, 1953, when the population of Singapore was estimated to be 1,120,800. Of this, it was estimated that the population of the City was 800,700, and that of the Rural Area 320,100.

88. The post-war migrational pattern has been quite different from that characteristic of the pre-war period. The amount of movement has been much less, and in 1952 and 1953 there was a small net loss by migration to countries outside Malaya; in 1953 the loss was only 652. It is possible that the outward flow during 1954 may be higher, if trends during the first quarter are taken as an indication. These show a net monthly movement out of about 1,000. Little is known however of the exact nature of this movement. Amongst the Chinese it seems likely that between some 5,000 and 10,000 more men leave the Colony than enter it each year, but the movement of women and children is about the same in each direction. In the past, there was a net influx of Indians, but this has been reversed in recent months, so that now more Indians—particularly males—leave the country than enter it.

89. This small net loss by external migratory movement is at present offset by a net gain of some 500-1,000 person a month resulting from the movement of people from the Federation to Singapore.

90. *Future Trends.*—It seems probable that Singapore's attraction as a metropolis may continue in the future unless there is a period of extreme and prolonged unemployment in the Colony. The population of Singapore could increase by between 120,000 and 240,000 over a 20-year period by migration from the Federation of Malaya.

91. On the other hand, the factors controlling migration to and from other countries are much more difficult to assess. *At present, the inflow as result of movement from Malaya is approximately the same as the outflow to countries abroad,* but the situation is constantly changing. In view of these uncertainties, no assumption has been made in the Master Plan about future migrational trends.

Births and Deaths

92. *Past and Present Trends.*—In 1953, the excess of births over deaths was 43,006 and the crude rate of natural increase 38.4 per 1,000 population. Crude birth and death rates are affected by the present age and sex structure of the population as well as by fertility and mortality rates at each age. In particular, the present very low crude death rate reflects the youthfulness of Singapore's population, as well as its relatively high standard of health. In order to anticipate future developments, trends in fertility and mortality need to be considered.

93. One measure of fertility is the Gross Reproduction Rate, which measures the rate at which present day mothers are producing mothers of the future. A rate of 3 for the Chinese population in Singapore signifies the fact that each Chinese woman of child-bearing age will, if present fertility remains unchanged, produce three female children. A similar measure for the Malaysians is 2.5. These figures are very high and it is possible that, over a twenty year period, they may show a decline due to several possible factors, one of which may be the spread of family planning.

94. In the absence of war or severe domestic crisis, mortality rates may be expected to decline. Infant mortality is still more than double that of the more advanced Western countries but the recent rapid improvement now developing in Singapore may be expected to continue. Such a decline would offset any probable decline in fertility rates.

95. The measure of reproductivity of the population, i.e. the rate at which the population is reproducing itself, is the Net Reproduction Rate. This takes mortality as well as fertility into account, e.g. a rate of 2.5 for the Chinese in Singapore means that each Chinese woman of child-bearing age is producing 2.5 female children *who will themselves reach child-bearing age.* The rates for Malaysians and Indians are 2.0 and 3.0 respectively, and are once again very high, and unlikely to show a rapid decline.

96. *Future Trends.*—Estimates of the future population of a country are usually based on one or more sets of assumptions which, while in no way prophecies, are reasonable projections, either of the past situation or of current trends. The demographic history of Singapore, as has been pointed out, reflects a very unstable state hitherto, so that an extension of past trends would have little value. It is safe to say that any changes in fertility rates are likely to be gradual and, in the immediate future, would probably be offset by lower mortality rates.

97. Population projections have been prepared by Dr. You Poh Seng of the University of Malaya, on fairly current trends, that is, on the basis of the 1947 fertility and mortality experience. These are contained in the *Report of the Population Study Group.* No account is taken in these projections of changes due to migration.

98. The assumption of unchanging fertility and mortality should not be taken to imply that no change is probable. The projections do, however, provide an estimate of future population growth against which the effect of any future developments can be assessed. The age and sex structure of the three main ethnic groups in 1972 has been estimated. Other groups, which between them only account for 3 per cent of the present population are not likely to constitute a significant element in the future population. Those age-groups which have already been borne, i.e. those who will be 18 years of age and over in 1972, cannot be affected by fertility changes and their numbers will not be greatly altered by lower mortality rates, so that for these age-groups, apart from any possible effects of migration, the estimates provide a sound basis for planning. The projections described provide the basis for all the calculations in the Master Plan.

99. These projections show that the population of Singapore will reach about 2 millions by 1972, i.e. almost double the mid-1953 total. No allowance has been made for possible changes by migration.

Age and Sex Structure

100. *Past and Present Trends.*—Before the war, the age and sex-structure of Singapore's population was largely dictated by the characteristics of the migrant portion, which mainly comprised males in the working age-group of 15-54 years. This male section, which in 1936 accounted for 43 per cent, had decreased proportionally to about 33 per cent by 1947.

101. The sex-structure has also changed: in 1936 the proportion of females per 1,000 population in Singapore Municipality was 395, but this had risen to 450 for the whole Colony in 1947.

102. *Future Trends.*—The following tables show the age and sex distribution for the three main ethnic groups as estimated for 1953 and 1972. This information is also summarised in Diagram I.

CHANGES IN AGE AND SEX-STRUCTURE, 1953–1972

Chinese

Age Group	1953				1972			
	Male	Female	Total	Per-centage	Male	Female	Total	Per-centage
0–14	190,090	176,460	366,550	42	382,100	357,830	739,930	46
15–54	241,070	208,040	449,110	51	377,320	358,340	735,660	46
55+	30,740	33,690	64,430	7	61,830	73,520	135,350	8
Total ...	461,900	418,190	880,090	100	821,250	789,690	1,610,940	100

Malaysians

Age Group	1953				1972			
	Male	Female	Total	Per-centage	Male	Female	Total	Per-centage
0–14	25,550	25,470	51,020	39	51,390	49,550	100,940	44
15–54	41,080	31,500	72,580	56	57,460	52,850	110,310	48
55+	3,860	2,900	6,760	5	9,910	6,990	16,900	8
Total ...	70,490	59,870	130,360	100	118,760	109,390	228,150	100

Indians

Age Group	1953				1972			
	Male	Female	Total	Per-centage	Male	Female	Total	Per-centage
0–14	13,860	13,730	27,590	34	35,320	34,330	69,650	48
15–54	40,110	10,320	50,430	61	35,120	24,840	59,960	41
55+	3,490	540	4,030	5	13,590	1,630	15,220	11
Total ...	57,460	24,590	82,050	100	84,030	60,800	144,830	100

Total of three main ethnic groups

Age Group	1953				1972			
	Male	Female	Total	Per-centage	Male	Female	Total	Per-centage
0–14	229,500	215,660	445,160	41	468,810	441,710	910,520	46
15–54	332,260	249,860	572,120	52	469,900	436,030	905,930	46
55+	38,090	37,130	75,220	7	85,330	82,140	167,470	8
Total ...	589,850	502,650	1,092,500	100	1,024,040	959,800	1,983,920	100

103. The tables show that a marked increase in the number of young persons in relation to the total population can be expected, and that the older section of the community will also show a slight increase. These increases will be at the expense of the middle age groups, which between them provide the greater part of the working population. In addition, the sex ratio may also be expected to undergo a change, and by 1972 the number of females may be almost the same as the number of males.

Summary

104. Future trends are summarised in the following quotation from the *Report of the Population Study Group*:—

> "By 1972 the population of Singapore will attain a figure of about 2,000,000. It will be a young population, with almost as many females as males at least up to age 50. At present, migration is a comparatively unimportant factor, but whether it will continue to be so in the future, or whether the trends will alter as a result of factors such as population pressure, economic attractions, etc. or even as a matter of governmental policies, there is no means of knowing.
>
> It is necessary to stress again that these estimates are based on the assumption that present fertility and mortality rates will continue unchanged. There is insufficient information to enable predictions to be made about the character and extent of future changes.
>
> It should, however, be pointed out (*a*) that any change in fertility and mortality, which should by no means be regarded as unlikely, will in general be very gradual, and (*b*) that as far as the working population, excluding migrants, is concerned, the projected figures provide a fairly good estimate of numbers in the various age groups."

105. The significance of these facts is discussed in other chapters of this report. One of the fundamental problems likely to face the Island in future is that of providing sufficient means of livelihood and housing for a rapidly increasing population, and the prospects of this, particularly in relation to a population of 2,000,000 in 1972, are discussed in Chapters Six and Seven. Sex parity, i.e. greater equality in numbers between men and women, will also presage the establishment of a more stable, settled community, upon the requirements of which, the proposals for community services (Chapter Eight) are based. Finally, the changes in age structure—in particular the enormous increase in the number of children—make essential the expansion in education services noted in the same chapter.

CHAPTER SIX

MEANS OF LIVELIHOOD

106. It is essential that the Master Plan should reserve adequate areas of land for places of work for the present and future population of Singapore. Under the general headings Commerce and Industry, Agriculture and Fisheries, this chapter discusses past, present and possible future requirements.

Commerce and Industry

107. *The Background.*—Singapore's past prosperity has been based upon trade. As the various territories of South-East Asia were opened up and the natural resources of the region developed, so the importance of Singapore grew as a centre for the handling of raw materials produced in the region and for the distribution of finished products from the factories of Europe and America. In the past, practically every aspect of life in the Colony found its roots in this trading background; specialized skills emerged, a specialized banking system was evolved and specialized channels of communication were developed. Singapore at present possesses a highly complex and efficient trading machinery which is without equal in South-East Asia.

108. The expansion of Singapore's trade did not proceed unchecked. Obstacles were encountered, but Singapore's unrivalled geographical position, its free trade policy and its experience always enabled it to surmount them and to adapt itself to the new conditions. The fact that Singapore has been largely peopled by immigrants assisted in this process for, if times were unusually bad, it was always possible for the migrants to return to their homeland.

109. This high degree of specialization in commerce and trade has taken place largely at the expense of development in other fields, particularly manufacturing industry. In the past, the earnings from the entrepot trade have usually been so large that other forms of investment were not attractive, and, indeed, were not encouraged.

110. *The Present Day.*—There is little doubt that Singapore today once more faces a grave challenge to its economic well-being but, although the outward signs of crisis are the same as at previous stages in the Colony's history, i.e. the contraction of foreign markets, the decrease in entrepot trade, the fall in commodity prices, etc., the circumstances in which the Colony finds itself are in many ways different. The free flow of trade in the Far East generally is hampered by national and international restrictions. On the one hand, military actions in parts of South-East Asia are, at the time of writing (June 1954), curtailing economic development and limiting the supply of raw materials and food, and on the other, there is an increasing tendency on the part of foreign governments to enter into bilateral trading agreements, by-passing Singapore. Finally, the migrant peoples, who could in the past return home if times were bad, are now settling in Singapore and are reproducing rapidly. This situation changes almost month by month; but whatever happens it seems true to say that trade, whether of raw materials, or of goods produced abroad, or of items manufactured in Singapore, is fundamental to the survival of Singapore. It is against this uncertain economic background that the proposals of the Master Plan are framed.

111. *The Industrial Study Group.*—It is not the function of the Master Plan to suggest remedies for the economic difficulties which face the Colony but, in framing the proposals of the Master Plan, the Team have thought it essential to take advice on the likely trend of employment in certain eventualities. The Industrial Resources Study Group was set up for this purpose, and their report is contained in the companion volume *Reports of Study Groups and Working Parties.*

112. So far as the Master Plan was concerned, the Study Group was asked to give an opinion upon the likelihood of there being sufficient employment to support a rapidly increasing population, and to provide an estimate of the amount of land likely to be required for industrial purposes. To answer these questions, the Group has made a thorough study of the present industrial structure, and supplemented its information by a survey of secondary industry. The results of this study are summarised below.

113. *The Existing Employment Structure.*—Diagram II summarises the employment structure in 1947 according to the results of the population census of that year, and also contains comparative figures for 1931; unfortunately, no more up-to-date information is available.

114. In the paragraphs which follow, present and possible future trends in each type of employment opportunity are outlined. In will be readily appreciated that the forecasting of future trends is a difficult and uncertain undertaking; for this reason, these sections can only give a very broad indication of the future. Nevertheless, they suffice as a basis for a Master Plan which is to be reviewed every five years, such review being based upon a continuing survey of the industrial situation.

115. *Agriculture and Fisheries.*—Diagram II shows that comparatively few persons are employed in these primary activities and it is unlikely that these numbers will increase appreciably in future. Because of their importance in relation to food supply, they are discussed in greater detail later in this chapter.

116. *Commerce and Finance.*—The diagram of employment structure shows that a greater number of people are engaged in commercial activities than in any other single type of employment. More than half of these people are engaged in retail trading, the remainder being in wholesale establishments, banks and commercial houses, or in one of the many small trading firms. Many of these establishments are linked with the entrepot trade and its associated industries which are termed "processing" in paragraph 118 below. Present trends indicate the volume and value of external trade is expanding very little. There is a continuing need for the development of retail trade irrespective of the general level of prosperity on the Island, but unless an expansion in external trade takes place sufficient to provide additional employment for the growing population, there may be serious consequences. A contraction in the volume and value of trading would have an even more serious effect not only in the narrow field of employment in commerce, but also more generally on the economy of the whole Colony. These are possibilities which the Colony may be forced to face and, on the advice of the Industrial Study Group, the Report of Survey makes certain recommendations which are based on the necessity to assist the expansion of secondary industry in order partially to offset such an adverse trend. In assessing future trends in commerce, it is, of course, possible to take a cautiously optimistic view of events in the long run, and the Team has considered it necessary to recommend, subject to certain precautions concerning traffic, that an increase should be planned in the amount of office floor space in the Central Area of the City of about 50 per cent between 1952 and 1972. This figure is based on the Study Group's estimates of possible future trends in employment opportunities and requirements in commerce and professions.

117. In 1952, the Team made a thorough survey of godowns, and concluded that much of the shortage of space then was caused by the building of speculative stocks of rubber and other raw materials. This situation has now eased and the Harbour Board's plans for increase in space are relieving it still further. A limited amount of additional land is allocated in the Master Plan for further godown accommodation.

118. *Secondary Industry.*—There are two main types of industrial activity termed "secondary". The first type has been called "processing" and deals with the handling, processing and packing for onward transit of raw materials such as rubber, tin, copra, timber, rattan, etc. Processing industries are linked very closely with the entrepot trade and their future has already been considered under Commerce and Finance above. The second type is "manufacturing" and occupies about 85 per cent of the people working in secondary industry. Very few of these persons work in factory organizations on a western pattern. Manufacturing industry in Singapore is at present characterized by the large number of small firms, often family concerns, engaged in the small scale production of a variety of finished goods, with an extremely variable standard of product, conditioned by the general lack of technical skills and organizational knowledge. These comments do not apply to the larger concerns established before, but more especially after. World War II, which are setting new standards in skill, organization and quality of product, but of which there are still comparatively few. The employment in these firms is about 20 per cent of the total number of people engaged in manufacturing industry. The development of manufacturing industry is therefore still in embryo, but the Industrial Study Group *have recommended that all possible steps should be taken by Government to encourage its development.* They are of the opinion that this would do much to ease the pressure of the rapidly increasing population upon available employment opportunities. The Team endorses this view. Upon the advice of the Study Group, some 2,500 acres have been reserved in the Master Plan for industrial purposes, and recommendations are made for the provision of additional industrial estates on the lines of those already developed by the Colonial Development Corporation and the Singapore Improvement Trust.

119. *Transport and Communications.*—This aspect is dealt with at length in Chapter Ten of this report. The diagram indicating the employment structures shows that some 45,000 people were employed in this type of industry in 1947, mainly in road and water

transportation. An increase of all forms of transport is to be expected, particularly passenger road transport. Commercial transport, whether by road, rail or water, is more dependent on the general level of trading in the Colony, the possible trends of which have already been discussed above.

120. *Public Authorities.*—The scope of public administration has expanded enormously since 1931 and this is reflected in a considerable increase in the numbers employed in central and local government, and by the armed Services. Much of this increase in civilian employment has been because a number of authorities, e.g., the Singapore Harbour Board, now employ large direct labour forces, whereas previously they employed mainly contract labour. There have also been increases in the number of school teachers, health workers and police in recent years. If the population of the Colony continues to increase, employment in central and local government will continue to expand; adequate and convenient areas are reserved in the Master Plan for this purpose.

121. *Professional Services.*—These are necessary in any community and are certain to increase in future with the expansion of the population. As stated in para. 116 above, allowance has been made in the Plan for an increase in office accommodation.

122. *Personal Service, Entertainment and Sport.*—About 60 per cent of the persons engaged in these activities are personal servants, and it is difficult to predict their future against a changing social background. Entertainment activities are likely to increase with population, as are sports activities, and the latter will be encouraged by the increasing interest in sport at schools.

123. *The Future Level of Employment.*—On the bases of present trends, the population of the Colony will reach two millions in 1972 (see Chapter Five), and it is possible to calculate the approximate number of persons who might be requiring employment at that date. The Industrial Study Group have done this, and have compared their estimate with possible future employment opportunities in the different industrial groups, basing their conclusions upon the detailed studies discussed in the foregoing paragraphs. The limitations in these calculations have already been mentioned in paragraph 114 above.

124. The Study Group has come to the conclusion that the number of employment opportunities will not be sufficient to support two million people. As already stated, the Group consider that the pressure of population upon available opportunities could be eased to some extent by active encouragement by Government of the growth of manufacturing industry. But, even with such a policy of encouragement, it seems probable that the pressure may still exist.

125. *Under-employment.*—In the past, it was often the case that people who were unable to find regular employment took to hawking or similar activities to provide an income which, although very low, was at least sufficient for the necessities of life. Thus, unemployment in the western sense was comparatively rare and in 1947 only 862 people were enumerated in the population census as being unemployed. Although it is certain that this is an under-estimate it gives an indication of the then small size of the problem. On the other hand, under-employment is very prevalent, and its existence tends to conceal the true magnitude of the problem of unemployment. If prosperity is high, the income derived from such activities as hawking is usually sufficient to provide more than the necessities of life. If, however, prosperity is not high, there is a falling off in the number of jobs available, and more people are forced into hawking at a time when people generally cannot afford to buy as much as in prosperous periods. The increasing pressure of population tends to aggravate this situation, and the process cannot continue indefinitely without seriously lowering the standard of living. The provision of more opportunities for alternative employment would of course ease the situation.

126. *Provision for Commerce and Industry in the Master Plan.*—It has already been stressed that the discussion in the paragraphs above is to a large extent conjectural. For this reason, it is impossible to state with accuracy what population the Island will be able to support in 1972; within the short space of even one year, the whole aspect of the South-East Asian scene may have altered quite radically, setting Singapore against an entirely new background. The best that can be done is to plan on the basis of reasonably optimistic but practical assumptions.

127. On the basis of present trends and likely future developments, it seems probable that the upper limit which the Island can support by 1972 without a lowering of the present standard of living may lie between 1.6 million and 1.8 million people and the Island may by then have a surplus population problem building up to a figure of about a quarter of a million.

128. As stated in paragraph 118 above, some 2,500 acres have been allocated for industrial purposes in the Master Plan, and this should suffice to meet the need for industrial space of a population of 1.8 million, assuming that vigorous action is taken by Government to encourage the development of manufacturing industries.

129. Should events prove that the Study Group has underestimated the possibility of increasing, by such encouragement, the means of livelihood, the Master Plan is sufficiently elastic to enable more space to be allocated for the purpose, sufficient for the requirements of two million people in 1972.

Agriculture

130. *The Background.*—During the past 30 years there has been a change in agricultural practice in Singapore. Whereas previously there was an emphasis on rubber plantation, and padi was grown in certain parts of the Island, today the production of food crops and livestock is by far the more important. There is now little economic rubber left on the Island and padi farming is non-existent. It is doubtful whether there has been much change in the last 30 years in the number of farmers, or of acres cultivated, but cultivation now takes place on a different type of land.

131. Today's farming is intensive, on small-holdings rarely exceeding five acres, some of which are in upland areas, but the majority of which are low-lying, with a water-table sufficiently near the surface to enable ponds to be formed. Such low-lying land, often near estuaries, is preferred for agriculture. Soils are an important consideration and are discussed in Chapter Two on Physical Characteristics.

132. It is possible to differentiate in a general way between two types of farmer: the small-holder and the part-time farmer. The former is the most important producer of "cash crops", providing a large part of all the leaf vegetables and livestock sold in markets and by hawkers in the City. The part-time farmer, who rears pigs and poultry and grows cassava, bananas and papayas, is also of importance; his land requirements are less stringent than the small-holder's and can be met in areas normally used for temporary housing which have a good water supply.

133. *Food Production.*—This is a complex subject and, at the risk of oversimplification, it is proposed to discuss only those features which directly affect the Master Plan. Singapore relies on its rural areas for the main supply of fresh leaf vegetables, pigs, poultry and eggs; fruit, root crops and other local produce are of secondary importance. The remainder of the staple diet, including rice, dried foods and spices, must be imported from the Federation of Malaya or further afield.

134. The extent to which agriculture is developed on Singapore Island depends on the supplies available elsewhere. There are large tracts of South Johore which could be used for agriculture if the emergency permitted, and the cost of such a project may have to be weighed against the cost of using land on the Island. Prior to 1949, there was a considerable flow of foodstuffs and pigs over the causeway to Singapore. The flow was interrupted by the resettlement programme which uprooted farmers from their scattered holdings and settled them in new villages. Now there are signs that agriculture is being re-established in the new settlements in Johore, and pig rearing is being resumed.

135. *Agricultural Policy.*—During recent years, many new agricultural areas have been established by the Departments of Lands. These are being linked with resettlement projects from areas of temporary housing and agriculture with the City area, which are required for permanent housing. They provide land for both full- and part-time farmers, and by the grant of security of tenure, the Department hopes to encourage the development of these areas as permanent farmland.

136. As a result of discussions with technical officers of both Departments of Lands and Commerce and Industry, certain areas of land have been zoned for agricultural purposes. These areas either contain first class agricultural land, or are considered most suitable for resettlement purposes and all proposals for development for purposes other than agriculture in such areas will be referred first to the technical officers for comments, before alienation takes place. Thus, a high priority is given to agriculture on land which is considered to be most suitable for it. This policy may change: if conditions in the Federation of Malaya improve sufficiently to allow a large increase in agricultural areas there, then the priority accorded to the agricultural development of land on Singapore Island may be reduced.

137. In addition, resettlement areas are shown on the Colony Map where such schemes are taking place, or are likely to take place in the years to come. The significance of these rural resettlement schemes from the population aspect is discussed in Chapter Twelve on the proposals of the Plan.

Fisheries

138. *Background.*—Decreasing imports of fish from Indonesia, and loss of supplies from Japanese fishermen after the war reduced the level of fish supply from these sources from over 13,000 tons a year pre-war to 10,000 tons post-war. Local production increased in response and in 1952 accounted for over 30 per cent of the fish supply. However, increased local production is insufficient to compensate for the decrease or loss of supplies because the local fishing industry is essentially inshore and the number of fish small. The maximum yield of local fishing grounds is estimated at 4,000 tons a year. Any substantial increase can only take place by fishing further afield.

139. The expansion of the local fishing industry is necessary not only to augment decreasing imports but also to meet the nutritional needs of an expanding population. In addition, it will to some extent help to diversify Singapore's economy and provide additional employment to the local population. All future plans for the fishing industry are based upon the need to provide sufficient fish for a population of nearly 2 millions.

140. *Structure of the Fishing Industry.*—Persons working in the Singapore fishing industry include fishermen, fishing boat operatives, wholesale dealers and retailers. Most of the fishermen own their fishing boats and gear. They reside along the coast of Singapore and on the adjacent islands at about 40 fishing centres, most of which serve as collection points for local catches. Urbanisation has encroached on some of these centres. Displaced fishermen are being forced to new, but less accessible, areas, whilst others are taking to land occupations.

141. The existing marketing organisation comprises five auction centres, two of which are operated by the City Council, viz. the Ellenborough and Clyde Terrace Markets, besides 54 retail points in the City and 25 in the rural area. Imported supplies are invariably landed at the auction centres while local catches are landed at some of the 40 collection centres and then brought to markets by sea or land. Transport facilities consist of carrier vessels, lorries, cars, tricycles and bicycles.

142. *Land Requirements.*—The expansion of the fishing industry will entail the provision of adequate landing facilities at the right places. Of primary importance is the need for a *central auction market* with adequate landing facilities. The Clyde Terrace Market has now no such facilities on account of the reclamation of the area between the market and the sea, whilst access to the Ellenborough Market is limited to small vessels by three low bridges. Consideration is now (July 1954) being given to the provision of a site for a central fish auction market on land to be reclaimed in the Kallang area.

143. As a result of discussions between the Team and the Department of Fisheries, various sites are shown on the Master Plan *as fishermen's reserves.* It is intended to provide sufficient land in these localities for development at two families per acre, and the reserves themselves are based on an expansion of the industry itself sufficient to satisfy the fish requirements of two million people.

144. A survey of retail *marketing facilities* carried out by the Department of Fisheries in 1953 showed that there were 462 market retailers, 407 street retailers and 104 shop retailers in the City, as compared with 142 markets and 95 street retailers in the rural area. A relationship of total population to the number of fish retailers gave an average of 692 persons per retailer in the City and 1,025 in the rural area. The report of the survey stated that existing selling points were adequate and well sited in relation to the population served but pointed out the inadequacy of wholesale points in the City. The findings of the survey have received careful consideration by the Team in working out standards for the provision of markets in general.

CHAPTER SEVEN

HOUSING

145. The pressure of increasing population is felt most acutely in housing and that pressure is further increased by the needs of the many people poorly housed at present. Need for new homes arises from three main sources, as follows:—

(*a*) a large number of existing residential buildings are so dilapidated that they must be replaced;
(*b*) there is considerable overcrowding in buildings which are structurally sound;
(*c*) the population is increasing rapidly.

146. The preparation of a housing policy is the function of the housing authority; the function of the Master Plan is to co-ordinate such a policy with the policies of other users of land to secure good siting, efficient communications, adequate services and a beneficial environment. The Team has based its conclusions on the advice of the Study Groups and Working Parties concerned and on consultations, mainly with officers of the Singapore Improvement Trust but also with other housing interests. From this advice and consultation, the Team has proceeded to assess total housing requirements.

Types of Housing

147. The traditional Malay dwelling is the timber-walled, attap-roofed hut. Large numbers of these homes exist in the Colony and, if well-built in a proper environment, the attap hut provides a satisfactory home suited to the climate.

148. After the foundation of the present settlement in 1819, permanent buildings evolved in two main types, namely, the bungalow, a single or double-storey residence generally standing in its own grounds, and the shophouse. Both types still persist, but the shophouse in its traditional form, with a narrow frontage of 20 feet or less, built in terraces without side ventilation to a depth of 60 or 70 feet, is entirely undesirable by modern standards. The recent strong movement, both in official quarters and amongst the Colony's architects, away from the traditional shophouse design is wholly to be welcomed.

149. Latterly, large numbers of more modern forms of buildings, including terrace-houses and flats, have been built. This movement started after the first World War and accelerated greatly after the second World War.

Permanent Housing

150. *Past and Present Rates of Building.*—The biggest single influence on the provision of modern housing has been, and is, the Singapore Improvement Trust. Between 1930 and the last War, the Trust built 2,103 dwellings and shops, mostly in the form of flats. In 1947, the first year of resumption of building after the War, the Trust completed 224 dwellings and shops. During 1953, annual output had risen to 2,041, so that by the end of 1953, a total of 9,661 dwellings and 451 shops had been built. Vigorous plans for future housing have been made and are being carried out. The Trust's housing efforts are directed towards providing satisfactory permanent homes at as low a cost as possible.

151. Government, the City Council, the Harbour Board and other public authorities are providing homes to meet the considerable needs of their employees.

152. Private enterprise has made a notable contribution to housing, and lately there has been a tendency to build more for lower income groups particularly on those schemes which have had financial assistance from the Federal and Colonial Building Society. In 1953, private enterprise completed 2,054 permanent dwellings. Nevertheless, it must be noted that there is a lower limit to the cost of satisfactory permanent housing, a limit which puts such housing beyond the means of a large section of Singapore's population.

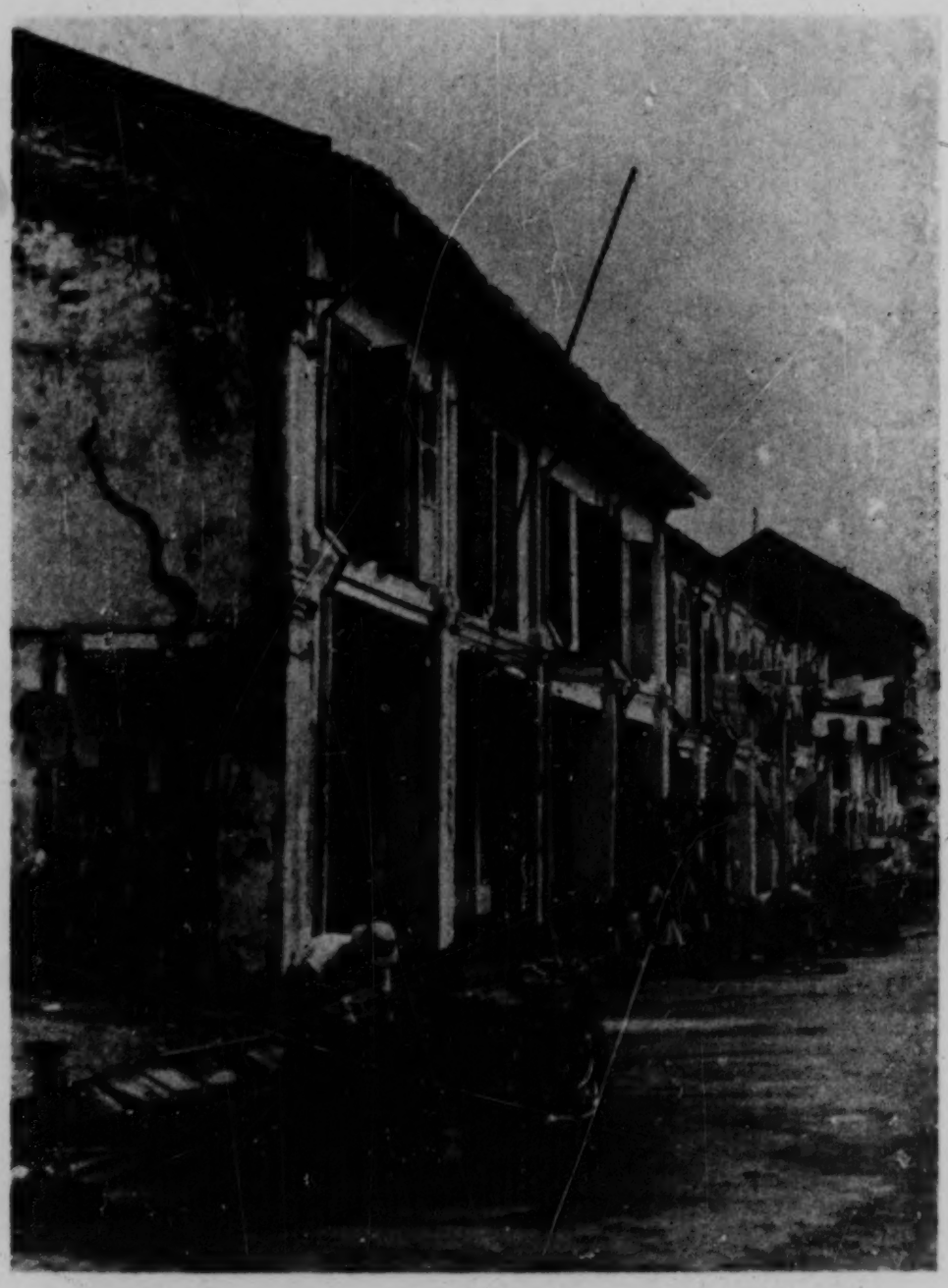
153. Rates of permanent housing in the years 1948 to 1953, inclusive, are illustrated on Diagram III and indicate a growing appreciation of the housing need. From a total of 1,308 dwellings in 1948, the first post-war year of real activity in the building industry, production has climbed to 4,946 dwellings completed in 1953.

154. *Future Needs.*—The probable rate of increase of population foreshadowed in Chapter Five indicates that, unless existing rates of house-building are increased greatly, there will be an ever-widening gap between the number of people in the Colony and the number of permanent dwellings in which they can be housed satisfactorily.

Central Area—A considerable amount of property is at or beyond the end of its useful life, dilapidated and insanitary (*para* 70)

Central Area—The average sizes and shapes of lots in individual ownerships are such that adequate development at modern standards is difficult (*para* 70)

Urban Attap Area—Living conditions in these areas are very bad, and it is considered that they can be rendered healthy by a planned programme of clearance and rebuilding (*para* 164)



Urban Area—The shophouse in its traditional form, with a narrow frontage of 20 feet or less, built in terraces without side ventilation to a depth of 60 or 70 feet, is entirely undesirable by modern standards (*para* 148)

155. To assess the number of homes required to be built between 1953 and 1972 to house all the population, it would be desirable to be able to estimate the number of new households being formed each year. Unfortunately, insufficient data is available to enable a projection to be prepared of the number of new households to be formed each year in the future. According to most recent data, the present average size of households is about 5 persons, and this figure is taken as the basis for future calculations. (The average size of households on Singapore Improvement Trust housing lists is seven, but this figure is attained only because the particular rules of registration employed by the Trust discriminate in favour of larger families.) From Chapter Five, it will be seen that there is likely to be an increase in population between 1953 and 1972 of about 880,000 by natural increase. This figure represents approximately 180,000 households and, if each household is to be provided with a separate dwelling, a residential building programme of about 10,000 homes a year would be required to meet the need.

156. During the next 20 years, an additional and substantial effort must be made to redevelop the obsolete areas of the City. Of the 340,000 people living the City's centre, it is estimated that about half live in dwellings which will have to be rebuilt before 1972. These persons represent a demand for about 30,000 homes, or 1,600 dwellings a year until 1972. The problems of redevelopment are referred to in more detail in Chapter Twelve.

157. The problems of persons living in temporary, mostly plank-and-attap, dwellings are discussed later in this chapter. The Master Plan proposes the movement of a part of this large population and it can be expected that some of these people will want permanent, rather than temporary, dwellings to live in. It is very difficult to conjecture how many such people there will be and the figure of 20,000 persons used later is, in the broadest sense, an estimate.

158. Finally, consideration must be given to the effect of migration on the housing problem. Present trends indicate that there is very little change in the size of Singapore's population as the net result of immigration and emigration but, as stated in Chapter Five, it is impossible to forecast migratory movement over 20 years. Although the effect of migration on the future housing problem must remain at present an unknown quantity, it may quite possibly prove an additional spur to the building of more homes.

159. From the figures in the foregoing paragraphs, it would appear that 1,050,000 people will require permanent dwellings between 1954 and 1972. On the basis in para. 155 above, this represents 210,000 homes, or a programme of over 11,000 permanent dwellings a year until 1972. It will be appreciated at once that these figures are theoretical. Any attempt to forecast developments on a period of 20 years must proceed on assumptions which the passage of time may alter. For example, the present rate of natural increase may not continue into the future, and substantial migration may take place in or out of Singapore. The Diagnostic Survey Team therefore regard a programme of 11,000 dwellings a year as a theoretical objective to be approached as closely as the resources of the Colony allow.

160. In its report submitted in *Reports of Study Groups and Working Parties*, the Building Resources Study Group, proceeding on certain necessary assumptions, has assessed the requirements in labour and materials of a residential building programme of 10,000 permanent dwellings a year. Whilst these requirements are formidable, especially the need to train building labour, they are not impossible to meet, granted firm guidance of the industry. It is doubtful, however, whether requirements much in excess of those figures could be met from the resources of this Colony.

161. A programme of 10,000 homes a year would fall short of the theoretical requirement by approximately 1,000 homes a year, i.e. accommodation for 5,000 persons annually, or about 100,000 persons in all by 1972. But it must be remembered that the figure of 880,000 in para. 155 representing natural increase of population until 1972 is a Colony total and includes the natural increase of all those persons now living in attap dwellings. If the plank-and-attap hut continues to be accepted as a satisfactory form of accommodation then it may well be that a rate of permanent housing of 10,000 dwellings a year would meet the Colony's needs.

162. *For the purposes of assessing land requirements in the present Master Plan, the Diagnostic Survey Team has decided to assume that a building programme averaging* 10,000 *permanent dwellings a year will be achieved in the near future and maintained at least until* 1972. The suggested building programme, based on a progressive increase until an adequate figure is reached, is described in Chapter Thirteen on the Realisation of the Plan.

Temporary Housing

163. Temporary housing is almost exclusively in the form of plank-and-attap huts. Within the area shown on the Town Map, the attap survey has shown that some 246,000 people are living in this type of accommodation, and it is possible that a further 150,000 live in attap huts in the rural area, including the Islands.

164. The most densely populated attap areas are near the City at Tiong Bahru, Bukit Ho Swee, Kampong Soopoo and parts of the Kallang Basin. Living conditions in these areas are very bad, and it is considered that they can only be rendered healthy by a planned programme of clearance and rebuilding. In addition, other attap settlements are on land which may be required for permanent housing and other uses, both public and private. It is estimated that it would be necessary to resettle approximately 161,000 attap dwellers at present living within the Town Map Area for one or other of the reasons stated, either to new planned resettlement areas or to permanent housing. The number it is estimated may require permanent dwellings is 20,000 persons. (See para. 169.)

165. A programme of resettlement has already begun, under Government control, of attap squatters on land required for public projects. Squatters displaced from land required for the new suburbs, Queenstown and Toa Payoh, are being offered the alternative of S.I.T. accommodation or plots of Crown land in areas suitable for attap development. The new settlements will be provided with public utility services, medical services, schools, shops and open space and will offer great attraction to those whose previous homes have been almost completely deficient of comfort.

166. All of the resettlement areas at present proposed are in the rural area, but it is likely that some resettlement may take place in the urban area in localities considered suitable for attap dwellings. At present, some 85,000 persons are living in such areas, but if properly planned, the areas could accommodate 148,000 persons at reasonable densities. It has been noted that certain of these urban kampongs are considered by the Fire Service to be bad risks: this increases the need to provide properly spaced layouts for them.

167. In the rural areas, the majority of attap dwellers are farmers, and the resettlement schemes are being planned with a view to supplementing the food supply of the Colony. This will be done by encouraging some settlers to cultivate small areas of farmland for crops for sale, and others to produce foodstuffs for the settlers' own consumption. (See Chapter Six.)

168. Unlike the problem of constructing permanent homes, that of building plank-and-attap huts is not a question of prodigious outlay in labour, materials and finance. A great deal can be done by self-help, but it is vital that future attap settlement should be carefully planned, and controlled to a degree that will prevent the growth of densely populated slums without adequate utility or community services, and subject also to the risk of fire.

169. The following table summarises the position regarding attap dwellers:—

Urban Planning Area	*Number of people*
Existing attap population	246,000
Less Attap population displaced	161,000
Attap population on good sites	85,000
Add New planned attap settlements	63,000*
Total future attap population	148,000

Net displacement from Urban Planning Area: 246,000 – 148,000 = 98,000 people. 20,000 of these people may require permanent houses.

Rural Area	*Number of people*
Existing attap population	150,000
Add Attap population displaced from urban area	78,000*
Add Natural increase of attap population	100,000*
Total future attap population	328,000

*All these persons will require *new* attap dwellings.

Summary of Housing Requirements

170. The following table summarises requirements for both permanent and temporary homes between 1954 and 1972:—

Total Housing Liability	*Number of people*	
Natural increase of population	880,000	
Redevelopment of Central Areas	150,000	
Displacement of attap dwellers	161,000	
To be met from		
Permanent housing		950,000
Urban attap settlements		63,000
Rural attap settlements		178,000
	1,191,000	1,191,000

Residential Density

171. In the Central Area (Redevelopment) existing net residential densities of over 1,000 persons per acre have been found in certain blocks, where people are living on less than 25 square feet of floor. An average gross residential density of 400 persons per acre persists over the whole of the Central Planning Area. In the Urban Planning Area, the existing average gross residential density approximates to 60 persons per acre. In the Rural Planning Area, residential density in some urban development is appreciable but very low elsewhere. Existing densities are illustrated on Maps Nos. 5, 6 and 7. These densities were determined as result of the Land and Building Use Surveys described in Chapter Four.

172. Proposed residential densities are described in Chapter Twelve.

Land for Housing

173. It is one thing to determine how many persons require to be accommodated by an analysis of population statistics and social needs; it is quite another thing to find sites on which to build homes. Over a million persons are now crowded on too small an area of land, especially in the Central Planning Area; to secure good living conditions for the present population, the total residential area must increase. To accommodate the future population, the residential area must increase much further. These increases in area must be so made that planning problems will be solved, and new ones not created. The juxtaposition of industry, commerce, communications and housing has had to be most carefully studied. The areas zoned for residential use in the Master Plan offer a solution to all these problems and provide land on which a programme of 10,000 permanent dwellings a year and an adequate number of temporary dwellings could be carried out at reasonable densities.

174. The following table summarises the proposed changes in distribution of population:—

1953		
Central Planning Area		
Population satisfactorily housed	190,900	
Population affected by redevelopment	150,000	
		340,900
Urban Planning Area		
Population satisfactorily housed in permanent dwellings ..	306,700	
Attap population affected by rehousing	161,000	
Attap population not affected by rehousing	85,000	
		552,700
Rural Planning Area		
Attap population	150,000	
Population in permanent homes	70,000	
		220,500
Population not specifically allocated to particular areas ..		6,700
		1,120,800

1972

Central Planning Area		
Population in permanent homes		290,000
Urban Planning Area		
Population in permanent homes	852,400	
Population in attap settlement	148,000	
		1,000,400
Rural Planning Area		
Population in permanent homes		
New towns: Woodlands	80,000	
Bulim	85,000	
Yio Chu Kang	35,000	
Elsewhere	120,500	
Population in attap settlement	347,500	
		668,000
		1,958,400

Conclusion

175. The above comprises a statistical review of the housing problem of Singapore summarised in Diagram III. In considering these figures however, it must never be forgotten that they represent the people of this Colony whose happiness every day depends very largely on the homes they live in. The problems is not to build four walls and a roof for all the thousands who need them but to build sufficient homes of good design in places where people will wish to live, where water, gas and electricity can be brought to them, the land drained, the buildings sewered, the roads built, the schools, hospitals and cinemas provided and the whole completed within the resources of the Colony.

CHAPTER EIGHT

COMMUNITY SERVICES

176. Closely related to housing needs are those for social and community services and the following chapter reviews the existing and possible future provision of such services.

Background

177. Since the population of Singapore was, in former decades, predominantly migrant in character, the development of community services lagged until 20-30 years ago, when the number of true residents started to increase significantly. During the nineteen thirties, women and children came in greater numbers, and family building started in earnest. Now, the proportion of "local-born" probably stands at over 70 per cent of the total population, and this proportion is still growing.

178. The population of Singapore is multi-racial and multi-lingual and even the Chinese, who comprise some 78 per cent of the total population, in themselves speak different dialects, some of which are mutually unintelligible. Under conditions such as these, it has not been possible for a common pattern of social requirements to emerge but, as wider contacts are made in business, schools and other fields of activity, barriers of race and tongue are disappearing.

179. A former characteristic of the population was the predominance of males, which largely conditioned the type of community activity. The present centres of social activity for the older generation of Chinese are the various clan associations; for the others there are trade guilds and mutual aid, literary and dramatic societies. Many men belong to one or other of these organizations, with the coffee shop also providing a popular, informal meeting place.

180. Since the war, numerically sex equality has become more marked, and a new pattern of social contact has emerged, centred about two types of institution. The first is the school: education services in the Colony have been expanding rapidly, and as a result, new social needs are arising: this especially applies to the development of outdoor activities. At the same time, the growth of community centres is being encouraged by a number of authorities, including the Department of Social Welfare, the Rural Board and the Singapore Improvement Trust.

181. In this chapter, community services are defined generally as those which contribute to the physical and moral well being of the people as a whole. They may be provided, or fostered by Government: this particularly applies to health services and education, and community associations; they may be some form of mass activity such as the cinema, the "Worlds", or Jalan Besar Stadium; they may be voluntary or private activities such as the clan organisations and certain youth activities; or they may be religious. In the preparation of the Master Plan, an assessment has been made of the needs of each of these activities and an attempt made to reserve land for them.

182. Before examining in detail the requirements of each community activity, it is necessary to state the basis on which the "neighbourhood" proposals of the Master Plan are put forward. The difficulties which are likely to be met in creating new communities, be they small "neighbourhoods" or larger units such as new towns or suburbs are appreciable. In this respect, the role of the Singapore Improvement Trust as planning and housing authority is crucial: e.g. in Queenstown, provision is being made by the Trust for many forms of community activity. Only by practical examples, largely experimental, such as this, and by the private developer as at Serangoon Garden Estate, can an effective attempt be made to create communities.

183. In order to establish standards, and allow a plan for community services to be related to local conditions and needs, the Colony has been divided into planning districts. (See Chapter One.) In defining these districts in the urban area, account has been taken of the fact that community requirements vary, and the social requirements of persons living in particular areas have been one of the factors used in defining district boundaries. Moreover, most districts have been chosen with a view to the formation of district centres. In the rural areas, a different principle has been adopted, the planning districts being geographical areas which are focussed on rural centres in which it is proposed to locate

major community services in the future. In most of these planning districts, it is proposed to create a district centre, which will comprise a community centre, playing fields, a health clinic, and where applicable, a post office, labour exchange and library.

184. No attempt has been made to define these areas in such a way as to give each an approximately identical population, and their size varies within large limits. Some are complete entities in the community sense, but in other cases, they extend over too wide an area to present a degree of social cohesion, and it is considered desirable to form local centres on a more truly neighbourhood basis comprising the community hall, health clinic or nurse or midwife centre.

185. It is proposed that these district and local centres should be provided with adequate facilities for all types of leisure activity, including outdoor games, and in order to establish the required standards, enquiries have been made of a number of official and unofficial bodies.

186. In addition, the Social Studies Department of the University of Malaya has carried out a small scale sample survey in certain parts of Singapore to provide valuable corroborative evidence upon leisure activities. Further mention of this work is made in paras. 206 and 208 below.

187. The following paragraphs discuss particular community services.

SERVICES PROVIDED BY GOVERNMENT

Education

188. The problems involved in providing schools for the rapidly increasing population have been summarised in the recent report to Government of the Director of Education, and the policy outlined in that report forms the basis for the education proposals in the Master Plan. The magnitude of the problem has been demonstrated in Chapter Five, the table in which shows that the 0-14 age group will reach 46 per cent of the total population in 1972. By a similar projection, the Director of Education has estimated that there will be an increase in the number of children between 7 and 12 (the primary school age groups) of about 114,000 between 1954 and1965, which will entail the erection of about 114 extra schools. Secondary and further educational facilities must be increased in proportion.

189. Insofar as the Master Plan is concerned, the problem is that of providing sufficient sites of adequate size to enable this expansion to take place. In discussions with the Director of Education, certain basic principles have been established, which may be summarised below:—

(*a*) that provision must be made for sufficient primary schools to accommodate one-fifth of the total population (school-children between the ages of 7 and 12 years), and for a further proportion of these to advance to secondary schools;

(*b*) that the average size of primary schools will be 500 pupils and of secondary schools, 700;

(*c*) that it will be permissible to plan for 2-session primary schools: thus each building will serve 1,000 pupils;

(*d*) that, wherever practicable, sufficient playing fields will be provided to enable each child to enjoy one games' period a week;

(*e*) that since economies in land for playing fields can be effected by grouping of several school on one campus, this should be done as much as possible.

190. Observing these principles, it has been calculated that the total site area for a two-primary-school campus (serving 2,000 pupils in two daily sessions) would be 7.55 acres, including one acre for each three-storey school building. Similarly, the minimum requirement for secondary schools is 8 acres, including 3 acres for the building site, but a site of 12 acres is to be provided wherever possible. At the time of preparation of their report, new proposals for school and public open space are under discussion which may involve the dual use of playing field space by school-children and the general public, which may affect this standard.

191. In *the Central Planning Area*, it is possible only to obtain restricted sites for schools, and therefore in this area the standards put forward will not be achieved.

192. In *the Urban Planning Area*, a full analysis of existing and future deficiencies in school sites has been made in each planning district, and proposed sites are shown on the Town Map either as specific reservations or by symbols, sufficient to make up these deficiencies to the required standard. In certain cases, where the school site is sufficiently accessible, one acre sites have been added to the school site reservations to allow for other community requirements, as explained in greater detail below.

193. In *the Rural Planning Area*, all requirements have been shown on the Colony Map by symbols and, owing to the smallness of the scale, no site reservations are specifically indicated.

194. Specific sites have been reserved for higher education: in particular for considerable extensions to the University of Malaya, and for the new Nanyang University at Jurong. Both reservations represent the expressed requirements of the authorities concerned. In addition, a site has been reserved at Telok Ayer for the proposed Polytechnic building.

Community Centres

195. Community centres are an entirely new feature of life in Singapore, and are expected to provide facilities for a large variety of activities which are at present carried on in scattered premises. In such centres, halls are to be provided for wayangs, lectures, meetings, and indoor badminton; rooms will be attached for the use of clan associations, or youth clubs, for adult education, or for committee purposes; facilities for outdoor sport are to be located close by; and facilities may be provided for the growth of such movements as co-operative marketing. During the day, these centres would function as child welfare centres.

196. In each planning district, it is proposed where possible to reserve land for a district centre, with specially designed community buildings and in some cases playing fields. To the centre thus formed it is proposed to add a clinic, as discussed in more detail in the section on health services below; and, in appropriate cases by arrangement with the authorities concerned, as stated in para. 183, a site for a new post office and library, labour exchange and other public requirements.

197. *On the Colony Map*, actual sites are not indicated but, as stated above, in almost all planning districts a rural centre has been chosen where it is considered that these services should be provided. In those districts where it is proposed to found large new settlements, the district centre will be included within the new settlement.

198. *On the Town and Central Area Maps*, playing fields have been located adjacent to community centres where possible. This is frequently impossible, however, in the Central Areas where vacant sites suitable for such reservations—indeed for community facilities as a whole—are very few. In the main, such provisions have only been indicated where redevelopment schemes are contemplated with the 20 year period of the plan. For this reason there will still be deficiencies in certain districts after 20 years.

199. No specific reservations of land for playing fields for schools have been made in the Central Areas but, when detailed schemes are prepared for precincts, consideration will be given to relating the open space to the district centre (see also Chapter Nine—Open Space). Owing to the fact that detailed schemes for redevelopment are yet to be prepared, it has not been possible in all cases to show the actual site to be reserved for district centres on the Central Area Map.

200. Sites chosen for community centres on the Town Map are in relation to the needs of population they are intended to serve. They have been derived as result of conferences between representatives of the departments concerned.

201. The programme of construction of community centres is already under way, and in the next two or three years, the Department of Social Welfare, in whom is vested the supervision of these centres, is intending to build 10 new ones. The project will gain momentum in the coming years, and is likely to be vital factor in the fashioning of community life in Singapore.

Health

202. The future expansion of health services on the Island is being planned in close collaboration with the development of community centres. In brief, these services are to be of two main types (in addition to the main hospitals already in existence), the district hospital, and the maternity and child welfare clinics. As stated above, it is proposed that the latter should, as far as possible, be located at local centres. These services are at present the joint responsibility of Government and City Council, the former providing clinics in the rural areas, and hospitals and major services within the City, and the latter being responsible for clinics within the City.

District Hospitals

203. The Director of Medical Services is planning to meet the increasing need for hospital accommodation by the provision of a number of district hospitals serving those areas not readily accessible to the General Hospital. Besides this programme of dispersal the Director of Medical Services has plans for a thousand-bed specialist hospital and a Recovery or Convalescent Home, for which sites have been reserved in the Plan. All District Hospitals will be equipped with outpatient dispensary services.

Maternity and Child Welfare Centres and Clinics

204. In the Rural Planning Districts sites will be reserved for these centres in a number of villages. Indication that a site is to be reserved has been made on the Colony Map by an appropriate symbol. In some cases it is proposed to have resident health sisters, nurses and midwives, and in others only the latter.

205. In Urban Planning Districts, the additional acre attached or related to certain primary school sites will allow for a maternity and child welfare clinic to be provided if necessary.

SERVICES NOT PROVIDED BY GOVERNMENT

206. The paragraphs below discuss the result of consultations with private companies, organisations and other parties interested in entertainment, religion and retail trade. In this field, the evidence provided by the social survey already mentioned above was of considerable value.

Cinemas

207. Cinemas undoubtedly form the most popular form of mass entertainment in Singapore, and a study has been made of the existing provision with a view to the establishment of future standards. At present there are some 6-8 "first run" cinemas in the Central Area of Singapore, and it is unlikely that new ones will be constructed except to replace existing cinemas, should they be demolished. These cinemas show a variety of films to an English-, Chinese-, Tamil-, and Malay-speaking public. Considerable expansion is likely to take place in suburban areas, particularly in new and developing estates whence people have now to travel long distances to the cinema. These will show both vernacular and English films, as second or third run. It has been estimated that 60 cinema seats per 1,000 people is a satisfactory standard in Singapore, and this has been adopted in discussing the future distribution of cinemas with the organizations concerned.

The Worlds

208. Worlds are a form of amusement park peculiar to westernized cities of the Far East, comprising a permanent fair ground, stalls, cafes, dance halls, and cinemas. Although it is unlikely that the number of these worlds will increase in Singapore, provision may be made for additional ones in new settlements. The popularity of these amusement parks was amply demonstrated in the social survey mentioned in para. 186 above.

Religious Buildings

209. Many new temples are at present being constructed in Singapore, to add to the existing number. It will be essential to provide sites for such temples in new settlements, and in certain cases to study more fully the needs of the travelling wayang companies who perform at religious festivals in different parts of the Island often on temporary stages close to a temple.

210. Discussions have been held with other religious bodies, as a result of which the necessary provision is made in the Plan or in the course of its administration for the siting of places of worship.

Retail Trade

211. *Shops.*—It is a phenomenon of all large cities that there are proportionately more shops per unit of population in the older central part than in the outskirts. This contrast is more marked than usual in Singapore, for in many parts of the Central Area there is one shop for every 50 persons, whereas one shop for 2-300 persons is usual for the suburban area. In the Central Area there is a great variety in type and function of shops, from the large departmental stores of Raffles Place, to the numerous small Chinese establishments. Many of the latter are undoubtedly sub-economic, being run on a part-time or family basis in conjunction with other activities; it is this fact that leads to so high a proportion of shops to people. On the other hand, many of the suburbs certainly have too few

shops. A full investigation into the requirements of retail trade has yet to be made in Singapore but, based upon the information at present available on the number of shops in each planning district, it is proposed to adopt the standard of one shop per 150 persons. This standard, suitably adjusted to meet local variations in demand, will be used in all new development and redevelopment schemes.

212. *Markets.*—A further important acet of retail trade in Singapore is the public market, where all forms of foodstuffs may be bought. *Hawkers* provide a similar service, bringing fresh and cooked food to the doorstep, or being grouped in static pitches in certain parts of the City.* Policy by public and private bodies follows two main avenues. The first is the provision of additional permanent markets in areas which are deficient in them, and the second is to provide covered hawkers' pitches in an attempt to clear the present static pitches which at present occupy whole streets to the virtual exclusion of traffic, or spread out from public markets. It is very difficult to establish standards for the provision of market stalls, for the hawkers provide a complementary function, and it is wellnigh impossible to estimate the number of hawkers in the Colony. From a thorough study of the survey of markets and hawkers carried out by the Markets Investigation Team, it has been estimated that, for 600 persons, one stall should be provided for fresh vegetables, one for meat and one for fish. On this basis the market reservations of the Plan have been made.

*See Chapter Six for a discussion upon the future of the hawking population.

CHAPTER NINE

OPEN SPACE AND RECREATION

213. In 1951, the Playing Fields Committee, appointed to review existing provision for open space including playing fields and to suggest a policy for future provision, reported that the urban population, then 700,000, enjoyed only 243 acres of open space, about 0.35 acre for every 1,000 persons. The Committee recommended the adoption of a standard of 4.5 acres per 1,000 people, made up of 1 acre of school playing fields, 2 acres of public recreation grounds and 1.5 acres of public parks. It was recognised that this standard could not be reached in the central areas of the City and the Committee proposed its application over the whole urban area, making up in one place the losses in another. The deficiency at that time was an estimated 2,900 acres. The Report of the Playing Fields Committee was referred to the Team by Government for consideration in relation to the Master Plan, and has been carefully studied.

214. In relation to urban communities, open space fulfils two main functions: (*a*) the ventilation of built-up areas and (*b*) theprovision of land for recreation. Incidental to these functions is that of varying and beautifying the urban scene. Singapore has splendid assets in its sea-front, the Padang, the Botanical Gardens, and King George V and Farrer Parks, and the striking green-ness of the many trees which grow here and of the compounds in bungalow areas tend to obscure the serious deficiency in open space revealed in the Playing Fields Committee's report.

215. The Committee rightly related existing open space to population, and it is because of the rate at which population is increasing in Singapore that the open space problem has become increasingly urgent. In this tropical climate, and also because of overcrowding in many homes, people spend a great deal of time out of doors and for reasons of health it is necessary that there should be land available not too far from their homes where this time can be spent pleasantly and safely. As noted in the chapter on Communications, Singapore's roads have inadequate provision for pedestrians, and children playing in the streets are in constant danger from the heavy traffic. It is with these points in mind, namely that the provision of open space should be related to population and that open spaces should be easily accessible, that the Diagnostic Survey Team has approached the problem.

Types of Open Space

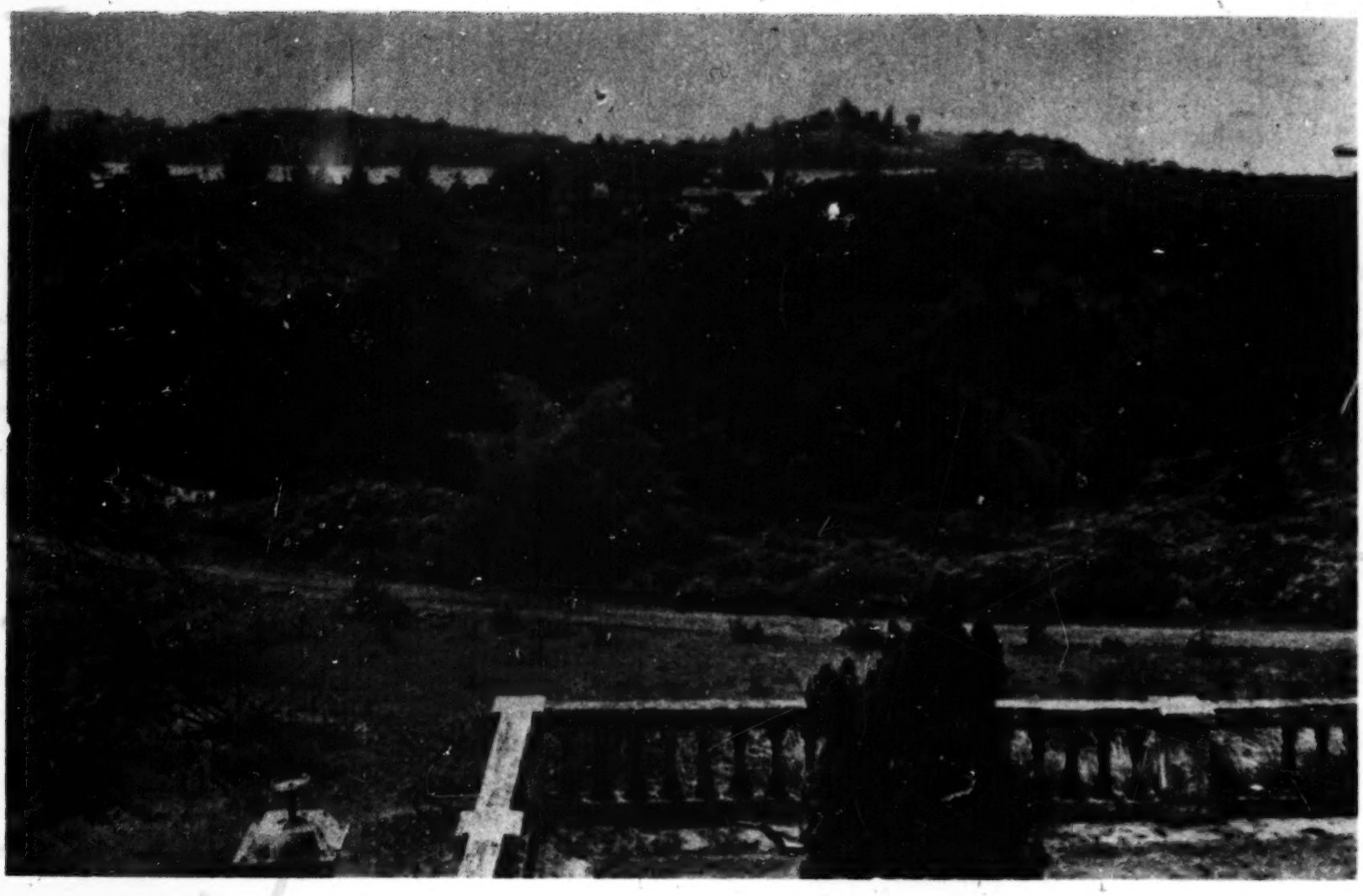
216. The following general classification has been made of types of open space according to the function they perform, and each is dealt with separately in further paragraphs:—

(*a*) *incidental open spaces*, i.e. open areas surrounding buildings;
(*b*) *district open spaces*, including playing fields, which serve a particular locality;
(*c*) *town open spaces*, including playing fields, which serve the urban population in general;
(*d*) *school playing fields;*
(*e*) *green belt and nature reserves;*
(*f*) *cemeteries;*
(*g*) *beaches.*

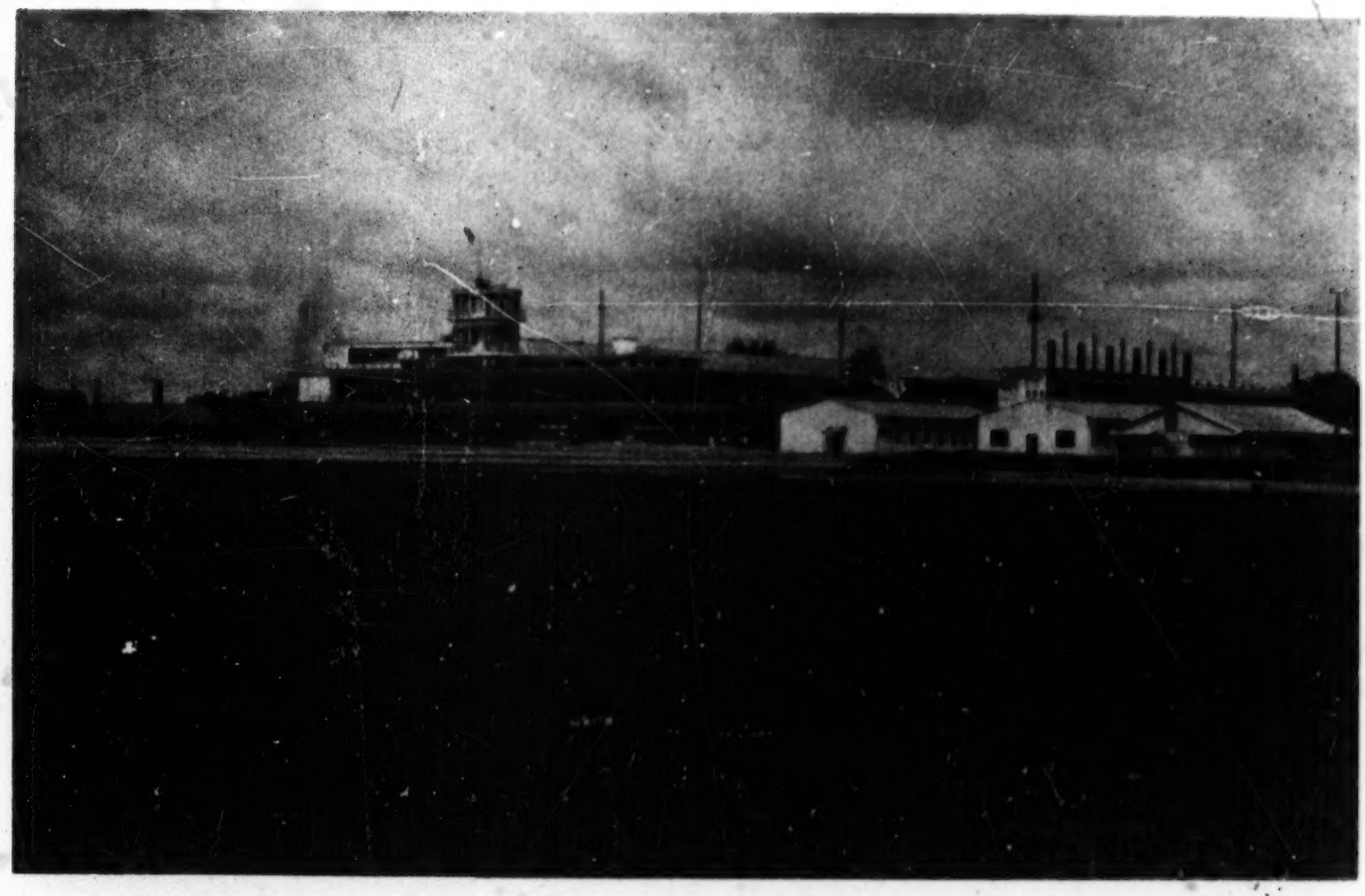
217. *Incidental open spaces* may be back yards, gardens, compounds or the open areas about blocks of flats: they are a positive factor in aiding public health by allowing air to circulate; on certain estates, particularly those of the Singapore Improvement Trust, grass plots have been provided about buildings on which children, especially the very young, and older folk can take the air and yet remain within calling distance of home.

218. *District open spaces* serve essentially local needs and consist of small parks, with playing fields, and planted with trees. They fulfil the need for an open space near at hand large enough to meet the requirements of the population of the neighbourhood.

219. In each of the planning districts defined by the Master Plan, one or more district open spaces, according to the size of population and the amount of land available, should be provided. In the Central Planning Area, densely populated and heavily built-up, it is unlikely that land can be found for sufficient open space and it may prove necessary to make up deficiencies elsewhere. The demand should be borne strongly in mind



Town Open Space—A further proposal is for a park at Mount Washington stretching along the tops of the coastal hills (*para* 223)



Town Open Space—That at Kallang on the site of the former Airport is proposed to be used largely for playing fields (*para* 223)

Green Belt—A major proposal of the Master Plan is the limitation of urban sprawl by the reservation of a "green belt" round the City

Green Belt—It is estimated that 1,152 acres could be used for parks and playing fields and the remaining 5,686 acres for such purposes as agriculture or institutions standing in their own grounds

during redevelopment. In the less intensively built-up Urban Planning Area, land is more plentiful and it is here, especially in outlying Urban Planning Districts, that central deficiencies may be made up.

220. Playing fields are of two types, school and public. (See para. 190). The former are, and are likely to be, fully used by the large school population and separate provision must be made for public playing fields. The requirement is identical with that for local district parks, i.e. that public playing fields must be near to the people they serve and of a size commensurate with local population.

221. To assess present demands for land for recreation a small sample survey was undertaken by the Social Studies Department of the University of Malaya: it is described in Chapter Eight. It scope was limited and the detailed results cannot be taken as representative of the population as a whole. However, two general conclusions as follows could be drawn on open space:—

(*a*) that the proportion of adults now playing outdoor games is very small indeed;
(*b*) that considerable use is made of parks and other incidental open space (even the islands of traffic roundabouts) by all sections of the community.

222. Although the present proportion of adults now playing outdoor games may be small, it should be noted that in the new schools adequate playing space is being provided and the children are being taught to play games. Consequently playing fields must be provided for them when they leave school. Failing such provision the physique they have acquired may find its outlet in juvenile delinquency.

223. *Town open spaces* are the large parks and playing fields to which all the people of the City resort: good examples are the Padang and Queen Elizabeth Walk, the Botanical Gardens and King George V Park. The beauty and inspiration which these give to the City and its people cannot be overestimated, and they are part of the fine impression of Singapore which travellers carry away. To find new town open spaces is difficult because of their size and to a great extent their provision must be fortuitous. Of those shown on the Master Plan, that at Kallang on the site of the obsolescent airport is proposed to be used largely for playing fields; it possesses a magnificent sea frontage. A further proposal is for a park at Mount Washington stretching along the tops of the coastal hills and, further from the City, parks are proposed at Bukit Batok and Ulu Bedok. These proposals will do much to reduce open space deficiencies and the possibility of further provision by reclamation from the sea must not be forgotten.

224. *School playing fields* have been considered in Chapter Eight under the heading of Education.

225. *Green belt and nature reserves.*—The provision made in the Plan for town and district open spaces will not provide enough land to satisfy estimated minimum recreational requirements in 1972, and more land must be reserved for parks and school and public playing fields. This cannot be found within the built up area and, if building were allowed to continue to spread, all open land accessible to town dwellers would be covered. A major proposal of the Master Plan is the limitation of urban sprawl by the reservation of a "green belt" around the City, and it is estimated that 1,152 acres could be used for parks and playing fields and the remaining 5,686 acres for such purposes as agriculture or institutions standing in their own grounds; but any buildings erected there must be of such a type as not to prejudice the main functions of the green belt in providing open space and limiting the spread of the urban area.

226. Under the Nature Reserves Ordinance, 1951 a number of nature reserves were designated, and a Board was set up to administer them. The primary function of the reserves so far designated is scientific, and certain restrictions must be placed upon public right of access in order to preserve the flora or fauna within them. There is also the extensive Water Catchment Area, to certain parts of which the public has access. Neither of these types of open space has been included in the total assessment given below, although parts of these areas are likely to be used as parkland in a similar manner to the land around the MacRitchie and Pierce Reservoirs.

227. *Cemeteries.*—Within the Urban and Central Planning Areas, about 2,500 acres of land are used as cemeteries. Of this, approximately 75 per cent is no longer used for burials, and in 1950, a Committee was set up to consider, amongst other things, "whether any of these grounds should be closed and made available for the development and expansion of the town . . .". The report of this Committee (*Report of the Committee Regarding Burial and Burial Grounds*, 1952) has been fully studied by the Team.

228. As noted in Chapter Three, custom favours hill land for burial purposes and, whilst such land is generally good for building, its devotion to cemetery use has preserved, in prominent and easily accessible places, large areas of open space. The Committee investigated the possibility of using this land for other types of development, and advocated measures "to compel the exhumation of graves more than 25 years old, when the land is required for development purposes."

229. In the majority of cases, the Master Plan proposals show the continued use of cemeteries for burial purposes, whether they contain graves more recent than 25 years old or not. The possibility of using certain burial grounds, without exhumation, as formal parks has however been considered in cases where burial has ceased for sometime, and the Town Map shows proposals for this. In other cases, proposals are made which will involve exhumation, but these have been kept to a minimum. It is nevertheless necessary to stress that, if definite action is taken on the recommendations of the Committee, large additional acreages of much needed land would become available for suitable alternative uses.

230. Large new cemetery reservations have been made in remote areas where such use is unlikely to affect other development for a very long time.

231. *Beaches.*—The availability of beaches in Singapore suitable for recreation is dealt with in the 1952 *Report of the Committee on the Development of Beaches in the Colony* and the recommendations of that Committee are endorsed. For the future, the possibility of a detailed survey of the coastline of the Island is being considered.

Future Provision of Open Space

232. It is of first importance that the provision for open space in the Master Plan be considered both in relation to the existing and the future population. In Chapter Five, the total Colony population in 1972 is estimated at nearly two millions, and of these it is possible that 1,300,000 will live in the Urban and Central Planning Areas. To meet the open space requirements of these people at the standard of 4½ acres per 1,000 persons recommended by the Playing Fields Committee would require about 6,000 acres of land.

233. The Redevelopment Working Party in its report in the accompanying volume have recommended that 2 acres of open space per 1,000 population is the desirable standard for the Central Areas. They considered that 1 acre per 1,000 should be provided in Town Open Spaces outside the Central Area, and a further 1 acre per 1,000 within the area itself. This should take the form of larger open spaces such as the Padang and King George V Park to the extent of ½ acre per 1,000, the remainder being in small local open spaces of 2-4 acres similar to the district open spaces described above. In practice these small areas can only be realised on redevelopment, and therefore, if the redevelopment programme suggested in the Plan is adopted, it is possible that 234 acres of land for open space will be realised by 1972, in the Central Area.

234. A further difficulty in relation to open space in general is the administration of its acquisition, laying out, maintenance and use and various public authorities have separate powers in this respect. The need for increase in the area of open space is great and urgent, and dual or triple control within any administrative area is fraught with the possibility that not enough might be done or that land might be provided in the wrong place. It is the strong recommendation of the Master Plan that the only effective way of providing enough open space quickly enough, and of efficiently maintaining it and ordering its use is by the allocation of full powers to a single authority, either the local authority, or one appointed specifically for the purpose.

235. The Diagnostic Survey Team has examined the question of open space in relation to the needs of each locality and to the land available. The proposals put forward are based not on empirical standards alone, but are closely related to what it should be possible to realise in practice and to the cost of acquisition of land.

236. The table on the following page summarises the existing and proposed distribution of open space in each Urban and Central Planning District.

237. The table takes into account 1,152 acres of proposed open space in the Green Belt. Generally over the whole Urban and Central Planning Areas, a standard of 2.25 acres per 1,000 persons has been provided for, excluding school playing fields, and 2.71 acres per 1,000 persons including them, on the basis of the 1972 population. Major open space proposals are shown on Map No. 9.

Planning Area	Planning District Reference	POPULATION 1953	POPULATION 1972	Existing Open Spaces Inc. School P. Fields (Acres)	PROPOSED ADDITIONAL OPEN SPACES: Town (Acres)	PROPOSED ADDITIONAL OPEN SPACES: District (Acres)	PROPOSED ADDITIONAL OPEN SPACES: S.P.F. (Acres)	Proposed Total Open Space 1972 (Acres)	Standards
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
URBAN	1. Tiong Bahru	98,400	101,650	6.7	...	36.7	58.4	101.8	
	2. Telok Blangah ...	18,800	25,200	...	155.2	4.4	16.5	176.1	
	3. Orchard Road ...	54,000	84,650	36.9	...	21.0	28.9	86.8	**1953**
	4. Toa Payoh	64,000	131,350	6.5	48.0	75.2	82.0	211.7	
	5. Queenstown	10,000	77,850	1.4	43.8	39.0	55.0	138.9	1.17 acres per 1,000 population.
	6. Whitley	9,500	18,200	...	22.5	...	15.2	37.7	
	7. Dunearn	3,700	16,150	...	...	5.0	11.2	16.2	
	8. Holland (N)	14,200	63,300	2.2	...	20.0	7.7	29.9	
	9. Tanglin	22,400	39,750	74.0	...	...	9.4	83.4	**1972**
	10. Pasir Panjang	9,900	12,850	...	9.7	12.3	5.5	27.5	
	11. Bukit Timah	12,000	54,900	...	146.0	24.5	40.3	210.8	2.67 acres per 1,000 population (exc. School Playing Fields).
	12. Thomson	5,500	28,850	1.0	85.8	12.9	19.2	118.9	
	13. Paya Lebar	58,200	106,000	1.2	...	45.0	68.2	114.4	
	14. Aljunied	24,100	53,000	...	317.1	16.1	44.0	377.2	
	15. Geylang	125,300	144,150	18.8	211.5	28.6	65.2	334.0	3.23 acres per 1,000 population (inc. School Playing Fields).
	16. Malay Settlement ...	22,700	42,550	1.2	...	20.0	31.8	53.0	
	Not related to districts	...	...	499.3	612.0	...	...	1,111.3	
	SUB-TOTALS ...	552,700	1,000,400	649.2	1,651.6	360.7	558.5	3,229.6	

					Town (Acres)	Precinctal (Acres)			
CENTRAL	A	13,200	12,900	1.5	...	...	No specific provision	1.5	**1953**
	B	50,800	48,600	15.7	...	2.6		18.3	
	C	7,100	8,600	7.0	...	...		7.0	0.31 acres per 1,000 population.
	D	25,000	23,400	2.4	...	8.0		10.4	
	E	62,700	49,300	3.4	46.1	21.6		71.1	**1972**
	F	4,600	3,500	...	...	...		...	
	G	25,400	13,800	22.1	27.4	3.0		52.5	
	H	10,100	7,300	28.6	...	...		28.6	0.74 acres per 1,000 population (exc. School Playing Fields).
	J	18,600	16,200	8.7	...	...		8.7	
	K	16,700	13,300	5.7	...	1.4		7.1	
	L	96,300	79,800	10.4	...	18.4		26.8	0.84 acres per 1,000 population (inc. School Playing Fields).
	M	10,400	2,500	...	...	...		...	
	SUB-TOTALS ...	340,900	279,200	105.5	73.5	55.0		234.0	
	GRAND TOTALS ...	893,600	1,279,600	754.7	1,725.1	415.7	558.5	3,463.6	

Over the wide Central and Urban Planning Areas the standard in 1953 was 0.84 acres per 1,000 population and the proposed 1972 standard is 2.25 acres per 1,000 population excluding school playing fields or, including them, 2.71 acres per 1,000 population.

CHAPTER TEN

COMMUNICATIONS

238. In any metropolis where the speedy movement of goods and people is essential for trade, the provision of good communications must form a principal part of any plan for the future. There are three factors to be encouraged in communications, viz. economy, safety and ease of movement. The means of encouragement are the careful siting of uses of land in relation to each other and to the traffic arteries, and the provision of facilities to meet the needs of each type of traffic.

239. Singapore is a sea-port of world importance and an international air station, and its roads carry very heavy traffic in proportion to their length and width. It also possesses an important rail link with the mainland. The following paragraphs discuss the problems arising under the general headings Road, Rail, Air and Port Communications.

Road Communications

240. The principal method of land transport on Singapore is by road: indeed, the internal movement of people by rail is at present almost negligible. This fact, coupled with the prosperity enjoyed during the rubber boom, has caused an enormous increase in the number of motor and other vehicles on the road. The pressure on the roads may be judged from the fact that in 1953 there were about 50,000 motor vehicles of different types, and about 175,000 bicycles, tricycles and trishas, but the length of public roads was only 295 miles. There is at present serious congestion, particularly at peak hours. Another attendant problem of equal magnitude is that of car parking, particularly in the Central Areas of the City.

241. The volume of traffic is not, of course, distributed equally on all the roads in the Colony but, until 1953, there was no clear idea of the volume of flow on each road. It was evident that a volumetric traffic census was needed and, with the help of a Traffic Survey Group representative of all traffic interests, such a census was taken in August 1953. Supplementary surveys were made of the parking problem in the Central Areas, and of the origin and destination of traffic within certain limited areas.

242. In summary, the work of the Team in road communications has proceeded along three main lines:—

(*a*) studies of the existing and probable future trends in the number of vehicles on the roads;

(*b*) studies of the flow of vehicles along the roads of the Colony;

(*c*) studies of the parking problem.

These lines of study are inter-related and each aspect is dealt with below.

Trends in the number of Vehicles on the Roads

243. The Colony of Singapore is a separate registration area for vehicles, and there are regulations ensuring that if the owner of a vehicle takes up residence outside the Colony, re-registration is necessary. Thus the volume of traffic on Singapore's roads bears a close relationship to the number of vehicles registered.

244. The very high rate of increase in population in the Colony has already been noted in Chapter Five, but the rate of increase in the number of vehicles registered in Singapore is proportionately even higher. In 1931, one person in 80 owned a motor car; by 1951 this ratio had become 1 in 43 and, by mid 1954, 1 in 30. A similar increase is recorded in bicycle owners and, in mid 1954, 1 in 6 owned a bicycle. Clearly, allowance must be made for such trends in assessing the future volume of traffic on Singapore's roads.

245. On the basis of a projection of past trends, it has been estimated that the total number of registered motor vehicles will increase between three- and four-fold by 1972, and this will affect volumes of traffic along all main roads, particularly those in the centre of the City. It is recognised that such a projection is hazardous: for example, the number of cars on the roads depends to a very large extent upon the level of prosperity at any given time. Nevertheless, it has been considered that, in planning for the future roads in the Colony, it would be foolish to under-estimate the likely traffic when preparing the Plan.

246. This projection may also be invalidated by a change in the travelling habits and facilities of the public. In the absence of any evidence that this may occur, the Team has not taken such a possibility into account at the present time, but consideration of it may be necessary at subsequent revisions of the Plan.

Traffic Flow

247. It was clear, many years before the survey of traffic took place, that the pressure of traffic on certain roads in the Colony was becoming intolerable, particularly at peak hours. Measures were taken to alleviate these conditions, but they were for the most part palliatives within the existing framework of roads. Failing any change in that framework, the traffic control authority were obliged to originate involved one-way and circulatory systems, which, though necessary to ensure the smooth flow of traffic, cannot be regarded as complete solutions to the problems. These systems deal tolerably well with existing traffic volumes but the number of vehicles is rapidly increasing. Before a plan could be prepared for a new network, it was necessary to know not only the volume of traffic on each existing road, but also what it is likely to be in 1972. The traffic survey provided the former, the projections noted in paragraph 245 above provided the latter.

248. The volumetric traffic census made in August 1953, was taken on all main and a selection of minor roads throughout the Island. A count was made of all types of vehicular traffic passing 154 given points in each quarter-hour period between 5 a.m. and 1 a.m. the next morning on four representative days.

249. The census gave a firm statistical basis for many facts which were already generally known, and provided many new ones. It had been known that the main bottleneck was Kallang Road, but the fact that the peak flow there was some 5,500 vehicles per hour, as high as pre-war traffic flows in Central London, underlined the need for a new bridge, and the figures themselves were used in determining its width. Similarly, high peak volumes along Serangoon Road and Bukit Timah Road and in a number of roads in the Central Area (particularly Collyer Quay and Raffles Quay) were also recorded by the census.

250. The flow of traffic in the urban and rural areas lying beyond the inner ring road takes place mainly along radial routes. (See Map No. 10.) The traffic in these areas originates from the residential estates lying off the main roads, along which there is a considerable build-up of traffic over very short distances and congestion at peak periods. This is particularly the case along Serangoon Road and Geylang Road. As new estates are developed off these routes, and large extensions to the built up area occur elsewhere, so the need for widening and straightening existing roads will become more insistent, and the demand for new roads will increase. The road proposals contained in the Master Plan, many of which are already foreshadowed by existing proposals approved by the Governor in Council, are described in Chapter Twelve, and illustrated on Map No. 12.

251. Congestion is particularly acute where these radial routes meet the inner ring road. The census showed that the peak volume of traffic approaching this inner ring is of the order of 10,000 motor vehicles per hour, i.e. about one-fifth of all the motor vehicles in the Colony approach this road during the peak hour. Map No. 4 shows that the volume of traffic from the east and north-east radials was far heavier than that from the west. Much of this congestion could be alleviated by improved junction design at these points of intersection.

252. The worst traffic problems of all occur in the Central Area, lying within the inner ring road, as illustrated in Map No. 11. In this area, the road layout follows largely the pattern laid down by Raffles and his successors a century or more ago. The main roads run parallel to the coast, being intersected at frequent intervals by other streets at right angles. Existing peak flows along these streets are very high, and even the initiation of the one-way system has not eliminated traffic congestion. The laying down of new roads is impracticable in this heavily built-up area except as part of large scale redevelopment, and even the widening of existing streets is a costly undertaking. The measures proposed in Chapter Twelve, which aim chiefly at the conversion of certain streets into through traffic routes, and the limiting of points of access to them, appear to be the only ones possible in the circumstances. One of the main means of achieving this object is the proposed construction of rear service roads, or the conversion of back lanes to that use. These proposed service roads are shown on the Central Area Map.

253. A factor contributing to congestion in the Central Area is the mixed nature of traffic. Cyclists, trisha riders and pedestrians compete with drivers of motor vehicles for use of the same roads. The bicycle must be recognised as a principal form of road transport and, where practicable, measures to aid cyclists must be taken, such as separate

cycle tracks on main roads. The slow-moving trisha, whilst supplementing public transport, takes almost as much room as a car, and is a source of delay to speedier traffic. Pedestrians, the most numerous element in road traffic, have had little consideration in the past and footways are rare and, in the City centre, often obstructed. The segregation of these elements of traffic must be sought, particularly on main roads.

Parking Problems

254. Of the 10,000 vehicles approaching the inner ring road during peak hours, the majority are destined for the business heart of the City, where they remain parked during office hours. To this must be added the shopping traffic which reaches its peak during mid-morning. At this time, every available parking space within the business area of the City is occupied: the need for additional parks was obvious, but the size of the problem had not been assessed.

255. A parking survey was therefore made in June 1953, by taking a series of aerial photographs over the centre of the City during the peak parking period. A count of vehicles on these photographs showed that some 5,010 vehicles were parked within town sub-divisions 1, 2, 4, 7 and 10, and of these, no less than 1,700 were located within the business centre (precinct K5 on Map 3), where the deficiency of parking space is most acute.

256. Proposals for multi-storey car parks are made in Chapter Twelve. This appears to be the only solution to a problem which will gain steadily in magnitude in the course of time and, ultimately, will stifle the progressive development of the business area unless remedial steps are taken. Other associated measures such as the proposal to limit business floor space in this area, the encouragement of business areas in other parts of the City, and the possible establishment of car parks at the inner ring road, are also explained in Chapter Twelve.

257. *Conclusions.*—Any solution to the problems outlined above must take a long time because of the expense involved and the extent of the work required to be done. The Master Plan proposes a phased programme of road improvement the priorities being based upon the findings of the surveys, and the future extensions of the built-up area.

Rail Communications

258. Singapore is served by a single track railway line connecting the port, via the causeway, with the Federation of Malaya, to whom the railway belongs. There are at present (July 1954) four main-line passenger trains a day, two up and two down, and a modest volume of goods traffic. The functions of this railway are to provide long-distance passenger and goods services as alternatives to road transport and, to some extent, to sea transport. The present rail service provides no significant relief to heavily trafficked roads within the Island of Singapore.

259. Principally as a means of relieving local road traffic congestion, consideration has been given to the expansion of the rail service on the Island, and the possible expansion has been related not only to existing or approved development but to what is proposed in the Master Plan, and in particular to the suggested establishment of new self-sufficient settlements and the growth of existing suburbs.

260. The role of any new local rail service would be the transport of people and goods between centres of work and population on the Island and two possibilities have been considered, viz. the provision of new railways and the extension of the service on the existing line. Both these possibilities have been the subject of investigation and discussion with representatives of Malayan Railways, experts in the United Kingdom and the transport representative of the World Bank.

261. *Provision of New Railways.*—First consideration was given to the possibility of providing a suburban railway, but the conclusion was arrived at that this would be impracticable, mainly on grounds of cost.

262. Consideration was then given to the possibility of constructing underground or overhead lines, but the nature of much of the subsoil makes the former practicable only at phenomenal cost, and the latter, also extremely expensive, would be both a serious disfigurement and a cause of disturbance to the occupiers of adjacent property.

263. *Extended Use of Existing Line.*—There remained for consideration the possibilities of using the existing line and improving it by doubling the track, providing new or improved stations at points related to new settlements, and possibly by introducing new branch lines. The problem was considered under two headings, namely passenger and goods traffic.

264. A factor of considerable importance is the position of the terminus on the west side of the City, some distance from its centre but close to the port. This is an admirable situation for goods traffic to and from the port and also for the numerous workers in the Harbour Board area, although many of these are housed nearby by the Harbour Board. The situation is not so convenient, however, in relation to other passenger traffic, although this could be much improved by providing an adequate bus station at the terminus.

265. *Passenger Traffic—Use of Line in its present condition.*—A limiting factor is the need to give a clear run to the morning and evening mail train which may be working at times coinciding with the local "rush-hours". Nevertheless, by the introduction of diesel-engined trains or rail-cars, and some relatively minor improvements of the track, possibly including some additional sections of double-track for passing, the passenger capacity of the existing line could be increased.

266. *Passenger Traffic—Possible Major Improvement of the Line.*—To enable the line to carry the passenger traffic to be expected when the new settlements proposed by the Master Plan are completed, its track would need to be doubled and the possibility of electrification considered. The construction of a branch line or lines would also merit attention.

267. The question of doubling the existing line should be considered immediately any experimental service, such as that referred to in para. 265 above, is under way, because the line is likely to be of greater use to the suburban settlements along the existing line, with a population working in the City, than to the self-sufficient settlements in other parts of the Island. These latter are likely to require rail facilities for goods traffic rather than for passengers.

268. *Goods Traffic.*—The part that an efficient goods-handling rail system can play in the relief of road traffic is of major importance. Elsewhere in this Report of Survey, the need to encourage the establishment of manufacturing industry has been stressed, and the size of that task is substantial. Every encouragement should therefore be given to the growth of the rail system as an agent for the transport of raw materials and the distribution of finished products. In proposing sites for new settlements, the possibility of future rail access has been kept in mind.

River and Port Communications

269. *Background.*—Singapore's river and port facilities are largely the product of its dual but interdependent function as a world port and as an entrepot. Its post-war volumes in shipping and trade show an increasing trend and, in 1953, over 46 million tons of shipping entered and cleared Singapore.

270. *Singapore Harbour Board.*—In 1952, approximately 62 per cent of the cargo handled by the port was worked in the Harbour Board premises which extend over 700 acres and possess over 2½ miles of wharves. Its existing facilities, which include extensive warehousing and ship repairing docks, are adequate to cater for the present level of trade and shipping, but the Harbour Board has plans for a long-term programme of expansion involving the provision of a new graving dock, additional berths and warehouses, and increased mechanization in the handling of cargo. Its existing docking and repair facilities are being fully utilised and an increasing number of vessels is being attracted to Singapore for docking and repairs. In 1952, approximately 5.7 million tons of shipping were docked.

271. *Singapore 'Roads' and River.*—Though the Harbour Board eclipsed Singapore 'roads' and river in the volume of cargo and shipping handled, the latter still retain their importance in the entrepot trade. The coastal steamers, small motor vessels and sailing junks that ply a trade in the produce of this region lie off in the 'roads', their cargo being handled by fleets of lighters which berth at public quays along Singapore River and in the Telok Ayer Basin.

272. The Singapore River is an important traffic artery for the entrepot trade. Along its lower reaches is located the complex but flexible machinery that regulates the entreport trade, comprising stevedores, ship and junk owners, lighterers and Chinese trading houses. Along the middle and upper reaches are situated the godowns where much of the merchandise of the entrepot trade is stored.

273. *Kallang Basin and Beach Road.*—At the mouths of the Kallang and Rochore rivers and off the Beach Road reclamation, berths are provided for junks that bring in logs, firewood and charcoal. The logs are floated up the rivers to the sawmills on their banks, and the firewood and charcoal are discharged along Crawford Street, being stored along

the waterfront for distribution to dealers. The proposals of the Kallang Basin and Aerodrome Redevelopment Committee of Government include schemes which will modify the use of these areas. In particular, the new bridge across the mouth of the Kallang-Rochore Estuary will prevent use of upper reaches by masted vessels. Proposals are contained in the Master Plan for providing new berthing facilities for these vessels.

274. *Land Requirements and Improvements.*—The Singapore Harbour Board has adequate land for future expansion, and improvement of its facilities lies mainly in the planning of a satisfactory link-up of the Harbour Board area with local road and rail communications.

275. The Team consider that the Singapore River should be retained as a traffic artery in the interest of the entrepot trade. Congestion arises along its lower reaches due to the lack of berthing space, and facilities for the off-loading of merchandise from barges on to lorries or godowns are at present inadequate. Plans are under consideration by the Singapore River Working Committee for setting back the river walls, particularly at bridges, to allow free flow of river traffic in the centre. Better berthing facilities are to be provided, and wider quays are to be constructed to enable off-loading to take place without obstruction to other traffic. The final draft proposals for the widening of the river and construction of new quays are contained in the Master Plan.

276. *Conclusion.*—In framing proposals for the Master Plan, the Team have recognised the importance of retaining existing river and port facilities. Recommendations are aimed generally at improvement of the existing network of communications related to such facilities.

Air Communications

277. Provision for air communications on Singapore Island is twofold; H.M. Forces operate stations at Changi, Seletar, Sembawang and Tengah, and the Director of Civil Aviation operates an airfield at Kallang soon (July 1954) to be replaced by a larger international airport at Paya Lebar.

278. For reasons of safety it is essential that the height of buildings on the approaches to these airfields should be controlled and, because of the noise associated with the operation of modern aircraft, the type of development permitted near airfields should be restricted on grounds of amenity and health. The extent of the area around airfields within which there is control of heights of buildings is indicated on the Master Plan by a circle centred on each airfield. These height controls are applied in accordance with the provisions of an international agreement; they are not onerous at the present time and will result in little restriction of development.

279. The construction of the new airfield at Paya Lebar is an event of great importance in the future of Singapore, which at present shares with Bangkok the functions of an air terminal for South-East Asia. The growth of air passenger traffic since the war has been appreciable and although it has not been accompanied by a correspondingly rapid growth in air freight such a development may be expected in future. Proposals for the use of land around Paya Lebar Airport should therefore take into account possible future requirements of industry and commerce.

280. Rapid and ingenious advances in air communications are being made in other parts of the world, partly in relation to the use of helicopters to connect airfields with urban areas, and it would be unwise not to consider such possibilities in the Master Plan. Land in the Central Areas of Singapore is at a premium and it is doubtful if any of the existing buildings would be satisfactory for adaptation as a helicopter landing station. The proposal to construct one or more multi-storey garages to relieve the car-parking problem might present an opportunity to combine this use with that of a landing station and this possibility is being borne in mind.

CHAPTER ELEVEN

PUBLIC UTILITIES

281. The need for co-ordinating the plans of the main statutory authorities providing water, gas, and electricity, sewage disposal, land drainage and telephones with plans for future urban development received early attention by the Team, assisted by extensive previous liaison with departments of the Trust, and close liaison has been preserved with relevant departments. All proposals shown in the Master Plan have been discussed with the authorities concerned, and their assurance has been given that no major difficulties are likely to arise in serving new development areas.

282. The provision of water, gas, and electricity is the function of the City Council. The supply of water and electricity is Island-wide, but the gas network does not at present extend far beyond the City Limits. Sewerage and land drainage are also the functions of the City Council within City Limits, and at present there are only a few smaller centres of population lying outside the City which are sewered. Telephones are shortly to become the responsibility of a public board. Each service is dealt with separately below.

Water Supply

283. The geology of water supply is described in Chapter Two; this chapter deals only with problems of distribution.

284. Water from Seletar and Peirce reservoirs is treated at Woodleigh pumping and filter station, and that from MacRitchie reservoir at a similar, considerably smaller, station on Bukit Timah Road. Treated water is pumped into the mains from these stations or is fed into a number of service reservoirs whence it is distributed further afield. Water from Johore is conveyed to the City through a pipeline crossing the Causeway and, having been tapped *en route*, is stored in a large service reservoir on Pearl's Hill. From there it is distributed through mains to the City.

285. Most of the Island is served by water mains, and although it will be necessary to supplement the distribution system in urban and suburban areas which are developing, water supply is generally satisfactory. Supply to new settlement areas on the West side of the Island would entail the relaying of mains over considerable lengths of road.

286. In villages in the rural areas and in urban kampongs, tap water is inevitably not so well distributed as in the towns. In the former case, the scattered and temporary nature of the buildings renders widespread distribution well nigh impossible, and although standpipes are provided in many areas, there is much local reliance upon wells as an alternative source of water: these are generally more plentiful in the east than the west of the Island. The supply of water to urban kampongs presents similar problems, and standpipes have in most cases been provided at frequent intervals.

Gas

287. The output from existing gasworks at Kallang is nearing maximum, and it is unlikely that major extensions to the existing system could be supplied without the construction of a new plant. This is under active consideration and it is possible that a new works will be constructed, on a site at present under discussion within the next 5-10 years.

288. From the existing works, gas is fed into nearby supply mains, or distributed by high or low pressure mains to gas holders in various parts of the city. Increases in demand in Paya Lebar will necessitate the construction of a further holder in that area within the next 2-3 years, and the site is provided in the Master Plan for this gas holder; additional holders will be constructed as required. From these holders, the gas reaches the consumer by low pressure grids.

289. Gas is not at present supplied to areas beyond the City Limits except in small areas, and plans for the development of the existing system are chiefly concerned with the improvement of supply within the area at present served, or with minor extensions, particularly in the western part of the City. It is expected that the supply network will be able to serve major development projects such as Queenstown and Toa Payoh which lie wholly or partly within the present City boundary, as well as other proposed development proposals in the Town Map Area. Largescale urban projects in the rural area could be supplied if gas mains are in the near vicinity.

290. At present gas is little used for industrial purposes, but it is possible that some increase may take place. The continued popularity of gas for domestic cooking provides the basis for future development.

Electricity

291. With the recent opening of Pasir Panjang Power Station an adequate supply of power at low rates has been made available by the Electricity Department of the City Council, and new generating plant is on order to keep pace with anticipated expansion of demand for electricity in the Colony for domestic and industrial use.

292. The Department's high voltage network has been extended along a number of the main roads. At selected points power is transformed down to normal supply voltages, at substations, for distribution at 6.6 kv. and 400 volts for industrial use, and 230 volts for domestic and other purposes. A supply is also given in bulk to the mainland to meet the whole of the electricity requirements of consumers in the vicinity of Johore Bahru.

293. It is planned to extend the high voltage network to cover further areas of the Island as the demand arises. Close liaison is maintained with the Electricity Department to ensure that substations are sited and mains laid to maintain an adequate supply to new or developing urban areas.

294. In general, the main distribution system is good. A reliable supply of electricity can be given in the areas now being developed and, provided the prospective demand justifies the capital cost of extensions, there is no accessible part of the Island which could not be given a supply.

Sewerage and Sewage Disposal

295. The main sewage disposal system operated and maintained by the City Council lies wholly within City Limits, and the present programme of extension involves the sewerage of only minor areas beyond. Consolidation of the existing service within the area already sewered is being given a high priority in this programme.

296. On the west side of the City, sewage is pumped from several drainage areas to the disposal works at Alexandra Road. The plant is now working to capacity and plans are in preparation for closing it down. Instead, the sewage will be pumped to a new disposal works occupying some 60 acres in Ulu Pandan by way of a trunk main passing through Queenstown. Treatment of sewage from the eastern section of the City is carried out at the Kim Chuan Road disposal works after pumping from the sector drainage areas. Plans for trebling the capacity of the works in two stages are now in the course of preparation.

297. A third disposal works situated near the outlet of the Serangoon River into the Johore Straits deals with the entire sludge and night-soil output of the City. This plant, together with the Kim Chuan Road plant and the proposed works in Ulu Pandan, should cope adequately with all proposed extensions in the built-up area shown on the Town Map.

298. All estate development within the City area lying outside the scope of the present programme must provide a local sewerage system gravitating to septic tanks. Such systems are usually designed in consultation with the City Engineer so that they may later be connected to the main system.

299. There are no major sewerage systems in the rural area. Although one or two major establishments such as the Mental Hospital and Changi Gaol have their own systems, private estates are usually provided with septic tanks at the developer's expense. Although some large scale projects for urban development may require the construction of entirely new treatment plants and systems, it is possible that new settlements which may be proposed could be served by the present system improved as described above.

Land Drainage

300. Land drainage problems are mainly concentrated within the City Limits where, owing to heavy rains sometimes accompanied by high tides, flooding occurs in certain localities. The chief areas of flooding within the City are in the Bukit Timah Road area, Orchard Road, Toa Payoh, and to a lesser extent in the Tiong Bahru area. There are also numerous other areas in which there are occasional minor floods. Flooding also occurs in the rural areas, but only in exceptional cases is the consequence as serious as in the City.

301. Schemes are at present being carried out, or are at an advanced stage of planning to alleviate flooding in the City area. These schemes are costly and include proposals of the continuous dredging of existing earth channels (as is the case of the Alexandra Canal), the reconstruction of others (as in Orchard Road), and the construction of entirely new canals (as in the proposals for diversion of flood waters from the Alexandra and Bukit Timah Canals).

302. There is an overriding need to consider drainage schemes on an island-wide basis and in relation to proposals for new development contained in the Master Plan, and close liaison has been achieved with the City Engineer both directly and through the Flood Alleviation Committee. It is anticipated that these drainage projects will on completion be able to eliminate existing floods, and cater adequately for the increased volume of flood water arising from proposed extensions to the built-up area.

303. Flood alleviation schemes are also projected in certain parts of the rural area, and the need to eliminate flooding will be closely studied in the development proposals for new settlements.

304. No major new drainage projects are submitted as part of the present Master Plan, but it is intended that the whole matter shall be the subject of further survey with the intention that a Colony-wide scheme should be submitted, possibly as a supplement to the Master Plan.

Anti-Malarial Drains

305. As a result of continuous action by the City Health Department over a number of years, malaria has been eliminated in the City area, and complementary activities by the Government Health Department in the rural area has rendered the disease rare outside the City. This has been achieved by the construction of a wide network of both permanent and earth drains and subsoil lines which reduce to a minimum the amount of stagnant water and prevent the creation of dangerous seepages. The service is constantly being extended as new development areas are opened up and, in general, it is not expected that the proposals shown on the Master Plan will present any major difficulties in this respect.

Refuse Disposal

306. This service presents no particular problems in relation to the planning of new areas. Discussions are proceeding with the City Council on the provision of a new site for an incinerator, and a proposal for this is contained in the Master Plan.

Telephones and Postal Services

307. No practical difficulties are expected in providing these services to new development areas.

Summary

308. It will be seen from the foregoing discussion that water and electricity—two fundamental requirements—may be supplied in adequate quantity to any part of the Island provided that there is a sufficient demand, and that adequate consultation takes place wih the authorities concerned at the planning stage. In general, other services would be met within the new settlements themselves or, in the case of additional built-up areas in the City, by extensions to City services. These facts have been borne in mind by the Team in the preparation of the Master Plan.

CHAPTER TWELVE

PROPOSALS OF THE MASTER PLAN

309. The proposals of the Master Plan are shown on the Colony, Town and Central Area Maps and the respective Programme Maps and are described in the Written Statement. The purpose of this chapter is to review the proposals in the light of the report of survey and research made in previous chapters.

310. Before considering proposals in detail, reference should be made to certain sections of the Introduction (Chapter One), particularly on the assumptions it has been necessary to make in preparing the Master Plan (paras. 6-9), on the scheme which has been followed in dividing the Colony into planning areas, planning districts and, in the Central Planning Area, into precincts (paras. 19-22) and on the way in which proposals are shown on the Maps (para. 23). It should also be remembered that this is the first Master Plan and that as result of further surveys, and changing conditions, amendments and additions to the Plan will take place.

311. The first part of this chapter discusses proposals under the following general headings:—

Population
Means of Livelihood
Redevelopment
Community Services—
- (i) Education
- (ii) Health
- (iii) Community Centres
- (iv) Religious Buildings
- (v) Retail Trade
- (vi) Miscellaneous

Housing
Open Space
Communications
Public Utility Services.

312. The second part of this chapter describes in some detail the proposals shown on the Colony, Town and Central Area Maps.

PART I

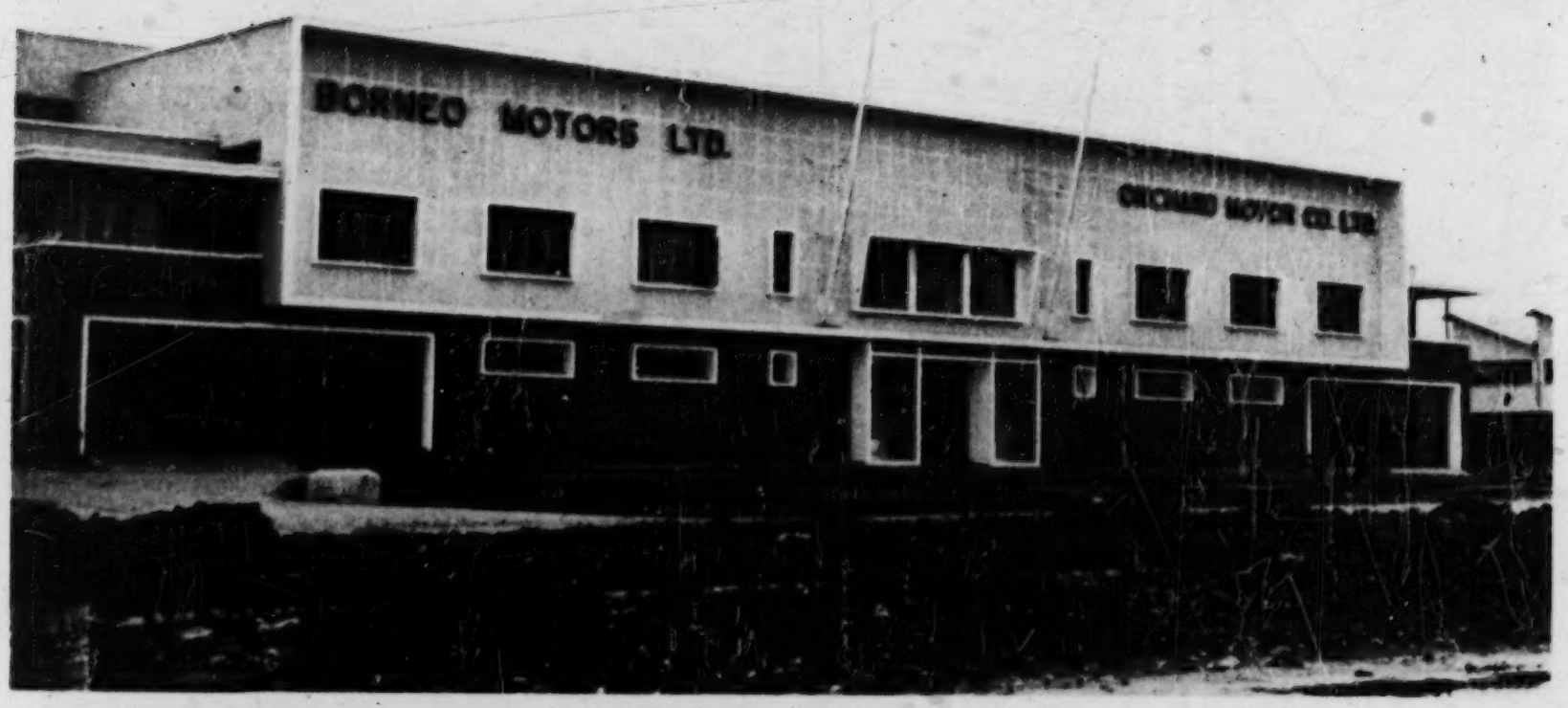
POPULATION

313. Behind each and every proposal of the Master Plan is the background set by the problem of increasing population. In Chapter Five it is stated that, if present trends continue, a population of two million people may be expected in the Colony in 1972. In the chapter on Means of Livelihood, the opinion is expressed that, provided active encouragement is given to the growth of manufacturing industries, the Colony should be able to support between 1.6 and 1.8 million people in 20 years' time at a standard of living equivalent to that now prevailing, but that any increase of population over these figures may cause a general reduction in standards of living. In Chapter Seven, a housing rate of 10,000 dwellings a year, achieved quickly and supplemented by a programme of attap housing, is estimated as likely to meet housing needs, although the possibility of overcrowding remaining in some areas, even with this high housing rate, cannot be ruled out.

314. If population growth at present rates were to be regarded as inevitable, and Singapore were to be considered as an isolated unit within which the population problem was required to be met, it would seem possible that in 1972, the standard of living would be lower than at present and a housing problem would remain. Singapore is not, however, an isolated unit but a metropolis with strong trading connections with other parts of South-East Asia. Whereas the Colony's land is at a premium and its economy is limited by a lack of natural resources, this is not true of land elsewhere in this region. The Master

City Centre—*You will most particularly observe that the whole of the space included between the Singapore River and the old limes, inland from the sea face to the back of the hill ... is reserved for the immediate purposes of Government*—Sir Stamford Raffles, 4th November, 1822

Traffic—Of the 10,000 vehicles approaching the inner ring road during peak hours, the majority are destined for the business heart of the City, where they remain parked during office hours (*para* 254)



New Industry—If trade does not expand to an extent commensurate with the increase in population, other means of livelihood must be encouraged. The best possibility lies in the encouragement of secondary industry (*paras* 319 320)

Post Office—In the rural areas it is hoped to provide community facilities mainly in existing village centres (*para* 343)

Plan therefore proposes that, in relation particularly to population and the consequential economic problems, *the future use of land in Singapore should be related to a Regional Scheme which would take into account land in the Federation of Malaya and other areas in South-East Asia.* This proposal is considered apt not only in relation to the immediate future or to the 20 years covered by the Master Plan, but also to the period beyond 1972 when, if present trends prevail, the descendants of today's children will constitute a population problem of even greater gravity than which now besets Singapore.

315. In deciding for what population the Master Plan shall provide, the Diagnostic Survey Team has accepted the forecast of population growth by natural increase as the strongest pointer and land for 2,000,000 people is reserved in the Master Plan. To provide for less would be to presume that emigration is likely to take place either as result of government policy, or due to the operation of economic factors at present unforeseen. The Team at present finds insufficient justification for such assumptions, and to deny the possibility that means may be found to employ all the breadwinners and house all the families these 2 million people is in their view unrealistic. Although provision has been made for 2 million people, it is necessary to point out again in this context the warnings contained in Chapter Six, particularly in para. 127, concerning the possibilities of full employment.

316. Other facets of the population problem have an equal bearing on future planning policy. In particular, the existing high proportion of children in the population and the likely increases in this respect, are referred to again under the subsection of this chapter on Education. Further, the proportionate decline in population within the working age groups will also present problems.

317. *Distribution of Population.*—The population of the Colony is at present unevenly distributed, for about one-third of its people live in the Central Planning Area. Although densities will always be high in the heart of the City, in the Plan it is proposed that some redistribution should take place to places elsewhere in the Colony in order to alleviate conditions in the centre. It is considered that if about one-sixth of the present number leave, conditions could be improved immeasurably for those who remain. To accommodate the persons who leave, and also the large natural increase—or the persons displaced by that increase, since it consists in the first instance of children—the Plan proposes the construction of new settlements of the following kinds:—

(*a*) *new suburbs* related to the parent City, of which Queenstown is a good example, comprising planned residential areas with adequate schools, open space, etc., and a measure of industrial and business use;

(*b*) *new towns*, planned for self-sufficiency, having a corporate life of their own, and largely independent of the City, with places of work and community services adequate for the majority of their population;

(*c*) *expanded villages*, of which the nuclei already exist, to be developed to serve as centres of rural life. The prime need of these centres is community services on an adequate scale;

(*d*) *agricultural settlements* on land little used at present, to accommodate farmers and market gardeners displaced from areas required for other development. These settlements would contribute to the maintenance of the supply of local agricultural produce.

318. Details of the proposed redistribution of population are contained in the Written Statement, but the following table provides a general picture of the changes proposed:—

Planning Area	1953		1972	
	Population	% Total Population	Population	% Total Population
Central	340,900	30.4	279,200	14.3
Urban	552,700	49.3	1,000,400	51.4
Rural (Inc. Islands)	220,500	19.7	668,000	34.3
Unlocated	6,700	0.6	...	...
TOTALS ...	1,120,800	100.0	1,947,600	100.0

MEANS OF LIVELIHOOD

319. It has been stressed many times in this Report and in the *Report of the Industrial Resources Study Group* that the future of Singapore is linked very closely indeed with the future trading background of South-East Asia. Should there be any diminution in the volume of trade in this part of the world, due to any factors whatsoever, it is an undoubted fact that the importance of Singapore will decline. There are no signs at present that such a diminution may take place, but an examination of port statistics shows that the volume of general cargo handled by the port has increased very little during recent years. Singapore's growth has in the past been dependent on an expanding volume of trade by means of which an over-increasing wealth has been accumulated in public and private hands. If trade does not expand to an extent commensurate with the increase in population, other means of livelihood—and so sources of wealth—must be encouraged.

320. The Industrial Resources Study Group considers that the best possibility lies in the encouragement of secondary industry, the development of which is still in its infancy in the Colony. They have made a number of recommendations which are contained in the report of the Study Group and are referred to briefly in Chapter VI, and the Master Plan itself is based broadly on the assumption that the required increase in secondary industry will take place.

321. The Study Group estimated that if the population continues to increase at the same rate as hitherto, there may still be an upper limit between 1.6 and 1.8 millions which the Island could support without a great lowering in the standard of living.

322. In so far as the planning of industrial land is concerned, the Group has provided the Team with an estimate of the amount of industrial land which would be required to provide for the necessary increase in industrial potential. The proposals of the Master Plan aim at localising industry in certain zones some of which are at present well established. These are discussed district by district in the second part of this Chapter. In addition it is hoped to provide land for industry in conjunction with the development of new towns and new suburbs on the Island. In these cases and in all other new industrial development the Team advocates the initiation of a policy similar to that adopted in the new towns in the United Kingdom whereby factory lots are leased by a development corporation.

323. Much of this land is at present in private hands, is sub-divided into awkward shaped lots, and is not provided with essential roads and services. It may well be that the best prospect for encouragement of industry in such cases is for a development corporation to be set up, to acquire and develop the land for industrial purposes.

REDEVELOPMENT

324. Together with the problems of an increasing population and the necessity of providing sufficient means of livelihood is a problem of equal severity set by the existence of a large number of buildings in the centre of the City which, by reason of age, condition, size, siting, sanitation and other factors, should be demolished and replaced. It is essential that a programme of redevelopment should be instituted in Singapore because the areas most in need of it lie adjacent to the principal business, shopping and civic centres, and are potentially some of the most valuable lands in the Colony.

325. The area which contains properties in most urgent need of redevelopment has been designated a "Central Area" under the Singapore Improvement (Master Plan) Rules, 1954, and is shown on the Central Area Map. It is contained in the Central Planning Area, the remainder of which is shown on the Town Map. Other Central Areas may be designated subsequently.

326. The problems of redevelopment have been closely studied by the widely representative Redevelopment Working Party, whose report is contained in *Reports of Study Groups and Working Parties*, which accompanies this volume. The findings of this Working Party are also referred to in Chapter Four. The Working Party has agreed "that if the people in the Central Area of Singapore are to be granted a relief from the most unsatisfactory conditions in which great numbers of them now exist, a policy of *comprehensive redevelopment* must be adopted and implemented by public authority over a substantial part of the Central Area, and this policy should be supplemented by measures to encourage the redevelopment of other parts of the City by private interests". In reaching this conclusion, the Working Party bore in mind that many people would require new homes as result of a programme of redevelopment, and that this could only be undertaken by a public authority engaged on a comprehensive housing policy. A further consideration was that in order to achieve the greatest economy in land and other resources,

and provide the future population with schools, open space and other facilities adequate to meet their needs, redevelopment in any one area must be planned and implemented as a single operation.

327. In the Central Area, planning districts have been further sub-divided into "precincts", each of which has a distinctive character, and are entities which should be planed as a whole. Some of these precincts have a predominant use—residential, commercial, godown or government; others have mixed uses but, as result of present trends, a future predominant use may emerge. The Plan seeks to encourage the development of both types of precinct, but at the same time discourage as far as possible the growth of uses which are not in keeping with the prevalent character of the precinct—such as industry in residential areas. These precincts form the basis for planning proposals in the Central Area.

328. The proposed programme of redevelopment is shown on the Central Area Programme Map. This has been based on the survey of existing conditions which has already been described. In formulating these proposals, the age and condition information was rechecked with some care, and will be kept under constant review.

329. These proposals do not involve a wholesale sweeping away of property and its replacement by grandiose and expensive schemes. The process does, however, involve a carefully selected programme of demolition of those blocks which urgently require it, and their replacement by dwellings and other buildings, leaving part of the cleared site for schools, small open spaces and other community buildings. Only in a few cases will it be possible to redevelop a precinct as a whole, but where this can be done, the prescribed standards for schools, open spaces and other buildings can be achieved without difficulty. In other precincts, only partial redevelopment will be possible, but it is proposed that this should be done on the basis of a plan for the precinct as a whole.

330. The Programme Map shows the stages by which it is proposed that this redevelopment should take place, together with the areas of school sites, open spaces and community buildings which it is considered may be obtained from the redevelopment programme for each precinct. These areas are related to the estimated future population of each precinct. The Programme Map also shows Crown property where original leasehold agreements have already terminated, or are likely to do so within the next two years. The existence of such property within a precinct appreciably increases the possibility of redevelopment, since acquisition costs are reduced.

331. The social consequences of redevelopment of the Central Area will be considerable, for it is clear that if the people remaining in this area after the execution of the programme outlined above are to enjoy reasonable conditions, it will be necessary for some people to move out to new residential areas offering attractions in the form of low rents, local employment and community services.

COMMUNITY SERVICES

332. *General.*—The community services and open space provisions for each planning district are described in greater detail under Part II of this Chapter. In Part I, it is proposed to deal with them in general terms, outlining the principles involved in allocating land for these purposes, and the standards adopted.

333. *Education.*—With the great increase during post-war years in the child population, emphasis has been placed on the development of educational facilities. The Team has had many discussions with officers of the Department of Education, and has evolved standards for the future allocation of land for schools and other educational buildings. These standards are set forth in paras. 189 and 190.

334. In summary, about one-fifth of the entire population is expected to be within the age range of primary schoolchildren, and if certain standards for the provision of playing field space are adopted, the amount of land required for primary school is about 0.7 acre for each thousand total population. By a similar method, if one-fifth of these proceed to secondary schools, an additional 0.5 acre per thousand population is required for this type of school.

335. The detailed proposals in each planning district have been worked out on this basis and have been discussed with the Departments concerned. Discussion is still in progress on some of these sites. In some cases where the general development of the land is expected to take place in the more distant future, and definite reservations for school sites cannot at this stage be made, the required sites have been shown symbolically on the Town Map.

336. In the Central Area, land for schools and other community buildings can only be provided if redevelopment takes place. Moreover, even where it is possible to provide such land, so great are the rival claims for other types of development that the standards put forward cannot be met. The proposed reservations for schools on the Programme Map for the Central Area are in general based on land for building sites only.

337. On the Town Map, it has in most cases, been possible to provide land for schools according to the accepted standard.

338. The Colony Map proposals for schools are shown symbolically in the village symbols.

339. In addition, specific reservations have been made for land for other educational establishments, such as extensions to the University of Malaya, the new Nanyang University, the Polytechnic Institute, etc. These reservations have been made in consultation with the authorities concerned.

340. *Health.*—As with education, the health proposals of the Master Plan have been fully discussed with both the Director of Medical Services and the City Health Officer and reference should be made to paras. 202 to 205 for a description of them. In brief, it is hoped to establish clinics wherever a local centre is proposed on the Master Plan. District hospitals are also proposed in certain areas to serve larger sections of the City.

341. *District Community Centres.*—For all community purposes the Colony, Town and Central Area plans have been sub-divided into planning districts. The aim of the Plan is to provide community centres, as described in para. 195, within many of these districts, and allocations of land for this purpose have, as far as possible, been made.

342. As a result of discussions with the Secretary for Social Welfare, the Rural Board and other authorities interested in such reservations, proposals for community centres have been included in the Master Plan. The size of such centres varies within wide limits according to the needs of the population and the size of the district which it is proposed should be served.

343. In the rural areas, it is hoped to provide community facilities mainly in existing village centres. The local of these centres is shown symbolically on the Colony Map. In certain larger centres—Bukit Panjang, Nee Soon and Ulu Bedok—it is possible that larger community centres will be provided to serve the needs of a wider area.

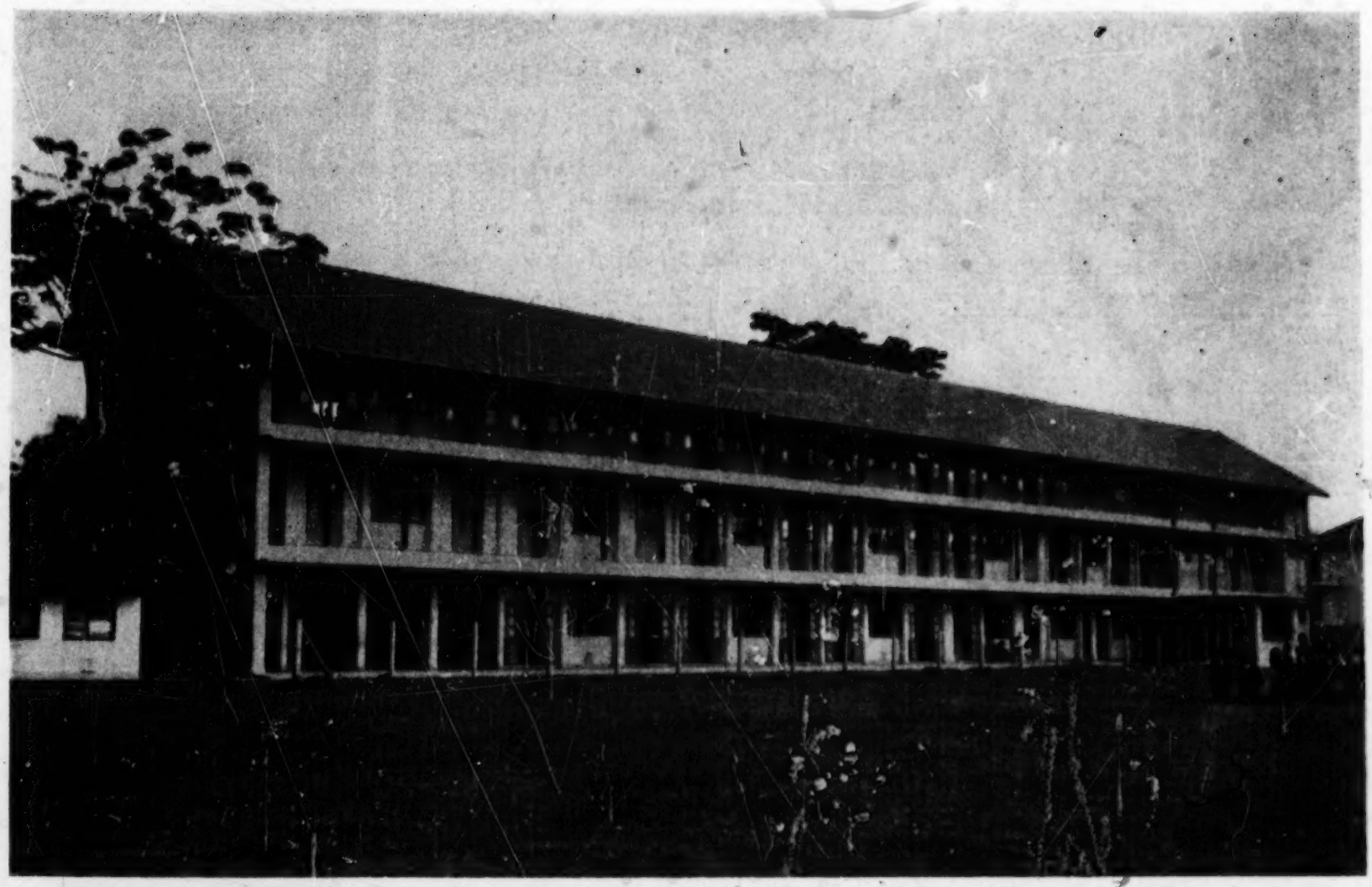
344. *Religious Buildings.*—It is recognised that in a country with so great a diversity of religion as Singapore has, care must be exercised in allocating the appropriate number of sites to each, and in all new major layout proposals reservations have been made for religious buildings of various kinds. Further reference should be made to paras. 209 and 210 on this subject.

345. *Cinemas.*—The standard for the provision of cinemas is contained in para. 207. It is possible in certain cases, such as Queenstown, to make specific reservations for cinemas on the Master Plan. In other cases, sites are developed by private enterprise in consultation with the Planning Authority, and in conformity with the general zoning proposals of the Master Plan and the standard of 60 seats per thousand population.

346. *Worlds.*—Apart from the possible provision of "worlds" in new towns and other large centres of population, it is doubtful whether there will be any additional establishments of this nature. No specific reservations have been made on the Master Plan for new world parks.

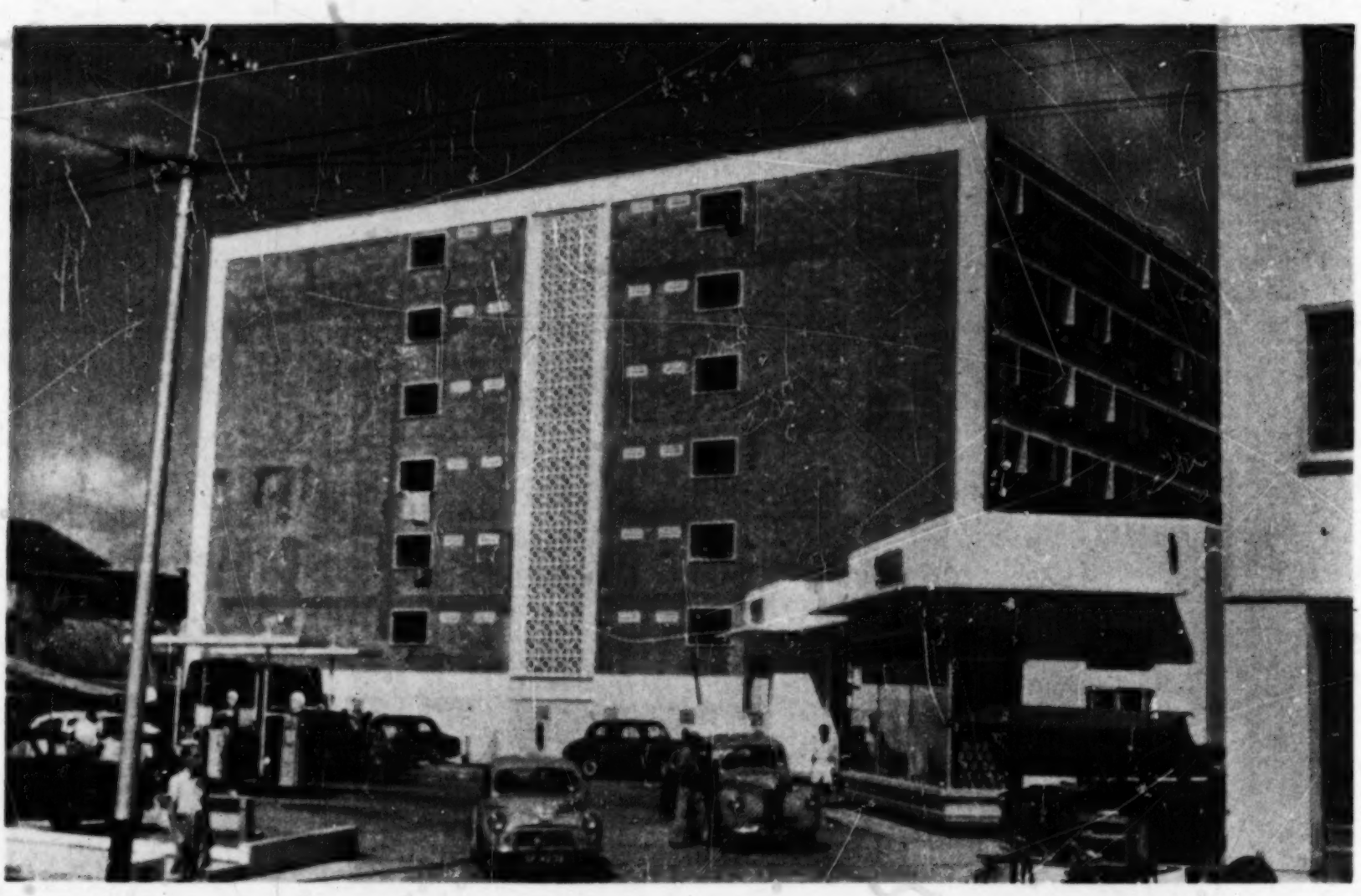
347. *Retail Trade.*—At present, there is one shop for every 50 persons in parts of the Central Area and about one shop for every 300 on the outskirts. It is considered that a satisfactory standard for future purposes in new development areas is one shop for 125-150 persons, of which a large proportion would be concentrated in a central shopping area. This standard has been used in determining the shopping areas required in planning districts and in particular, in the new Trust areas at Queenstown and Toa Payoh.

348. Another facet of the Plan is to encourage the development of main shopping centres in localities other than Raffles Place where the parking problem is rapidly becoming more and more acute. Such alternatives are those in Orchard Road and the well developed centre in High Street.

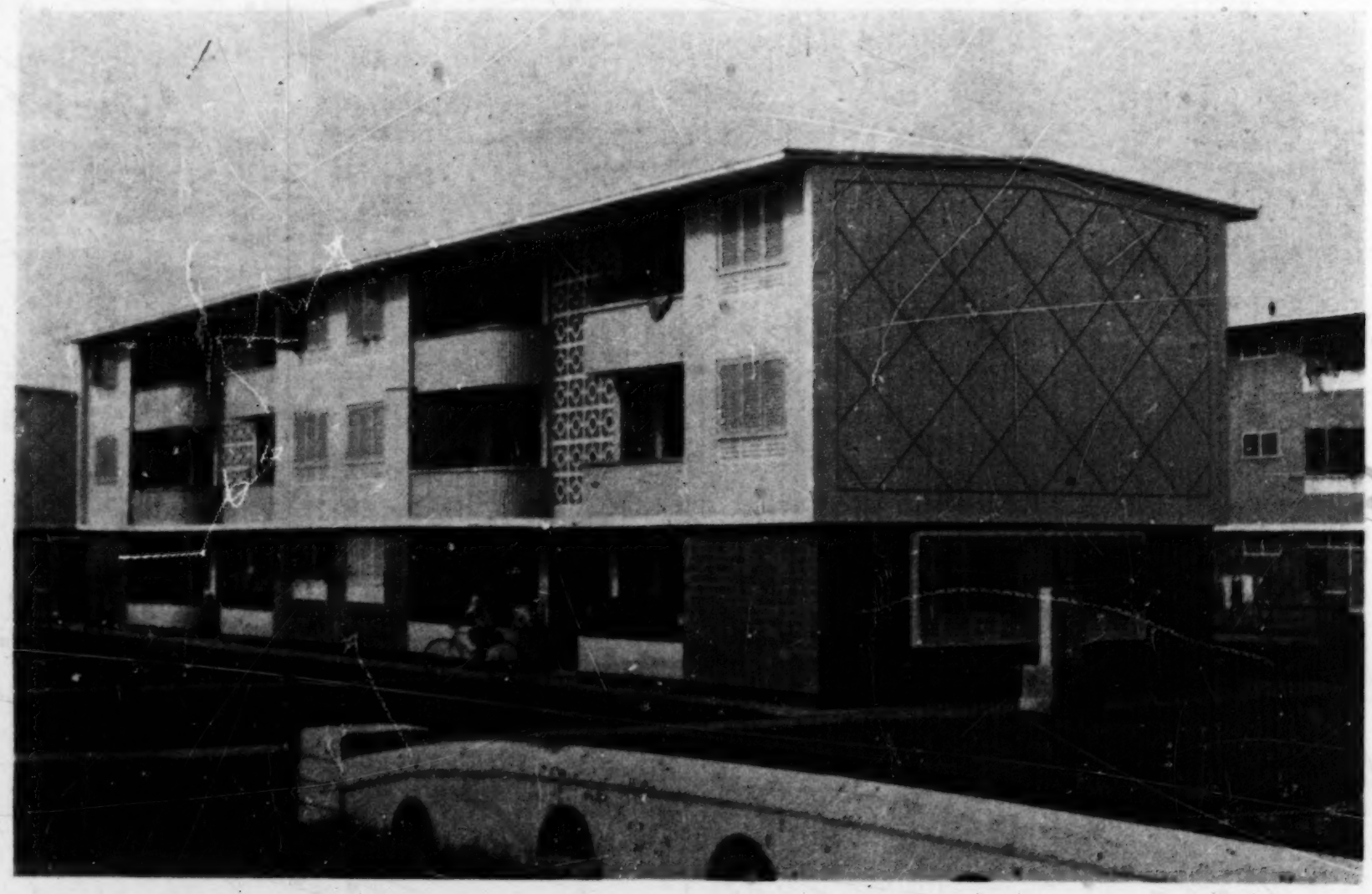


Primary School—About one-fifth of the entire population is expected to be within the age-range of primary school-children (*para* 334)

Clinic—It is hoped to establish clinics wherever a local centre is proposed on the Master Plan (*para* 340)



S.I.T. Redevelopment—A policy of comprehensive redevelopment must be adopted and implemented by public authority over a substantial part of the Central Area, and this policy should be supplemented by measures to encourage the redevelopment of other parts of the City by private interests (*para* 326)



S.I.T. Housing—For a 1972 solution of the housing problem, a peak rate of perhaps 11,000 permanent and 3,000 temporary houses would need to be achieved before 1960 and maintained (*para* 353)

349. Provision is also made for markets in areas where they are at present lacking, such deficiencies being calculated generally on the basis of providing one food stall for 200 persons. In addition, markets are to be so located in densely populated urban areas that no home is further than one quarter mile from a market.

350. *Miscellaneous.*—Other community needs are catered for in the Plan, as result of consultation with other authorities. *Post Offices* are planned in areas at present deficient of them, and new sites provided for Police Stations and Courts.

351. *Summary.*—The reservations outlined in the paragraphs above aim at providing a satisfactory basis for a form of life which, according to present indications, seems most likely to be fulfilled. The need for flexibility in the Plan has been stressed in other contexts throughout this document: it is nowhere more apparent than in relation to the social needs of a community the various elements of which have still to be fused into a homogeneous whole.

HOUSING

352. In Chapter Seven, housing needs in the period 1954-72 inclusive were estimated as follows:—

	Persons	*Homes (at 5 p.p.h.)*
Permanent housing	950,000	190,000
Urban attap settlements	63,000	12,600
Rural attap settlements	178,000	35,600
	1,191,000	238,200

353. In 1954 approximately 5,000 permanent and 500 temporary homes were constructed representing the highest housing rate ever achieved in the Colony, but leaving 185,000 and 47,700 temporary dwellings to be constructed in the 18 years between January 1955 and December 1972, in order to conquer the whole housing problem, including redevelopment. These figures represent a crude average annual housing rate of about 10,300 permanent and 2,550 temporary dwellings a year, *but* this rate could only be reached gradually and, for a 1972 solution, a peak rate of perhaps 11,000 permanent and 3,000 temporary houses would need to be achieved before 1960 and maintained.

354. The Master Plan reserves all the land required for this number of dwellings at residential densities ranging from the very low in rural areas to 560 persons an acre (net) in parts of the Central Area. The reservations in particular planning districts are described in Part II of this chapter.

355. In order that redevelopment of the Central Area may be carried out progressively, part of any housing programme must be reserved specifically for the re-housing of persons displaced temporarily by demolitions or permanently by decentralisation. It is estimated that 1,000 new dwellings a year out of the housing programme referred to in para. 353 above would meet this requirement and permit the completion of the redevelopment proposals of the Master Plan within 20 years.

356. The large increase in housing will make great demands on the resources of the Colony in finance, labour and materials. These demands are discussed in Chapter Thirteen on the Realisation of the Plan.

OPEN SPACE

357. It is generally agreed that Singapore is at present gravely deficient in open spaces. In the Town Map Area and Central Area there is at present only 754.7 acres of public open space, or 0.84 acres per 1,000 population. The recommendation of the Report of the Playing Fields Committee for a standard of 4.5 acres per 1,000 for the future Singapore has already been referred to in para 213. Having made a careful assessment of the amount of land available for this purpose, and in consultation with the City Architect, the Team have put forward a comprehensive standard of 2.71 acres per 1,000 population for all types of open space.

358. It is proposed that this open space should be provided as follows in the Central and Urban Areas covered by the plan:—

(*a*) *Green Belt—1,152 acres of which 610 acres are suitable for parks and a further acreage for playing fields.

(*b*) Town Open Spaces other than in Green Belt—1,600 acres.

(*c*) District Open Spaces, including precinctal open spaces within the Central Area—650 acres.

(*d*) School playing fields—580 acres.

359. The function of each of these types of open space is described in para. 216. In general, the Plan provides a system of open spaces designed to satisfy the need and convenience of the population. On the one hand there are to be large new parks and playing fields such as those proposed at Mount Washington and the present Kallang aerodrome respectively; and on the other it is proposed that small open spaces of 2-4 acres in size should be established in planning districts which will be within easy reach of the inhabitants of such districts. Map No. 9 illustrates the proposals.

COMMUNICATIONS

360. *General.*—The importance to Singapore of good communications has been stressed throughout this report. The measures proposed below to improve the present network are considered to be the minima required to meet a problem of complexity and magnitude.

361. *Road Communications.*—The principal means of movement on the Island is by road, and the requirements of two million people by 1972 will certainly overtax an existing system which barely meets the needs of one million. Radical improvements which will provide for a free flowing system of traffic are essential.

362. The road proposals of the Master Plan have been based on the survey and research outlined in Chapter Ten. Taking into account the increase in traffic flows likely to arise from new residential areas and from increases in the car-owning population, it has been estimated that traffic may increase between two- and four-fold on many roads. The measures described in this chapter aim at dealing with these flows as well as alleviating existing congestion.

363. All roads in the Island have beenn classified in the Master Plan under the general heading of arterial routes, major traffic routes, main thoroughfares or other roads. The only arterial route is the one connecting Newton Circus to the Causeway, and the works at present being undertaken on it should render it capable of dealing with the necessary traffic volumes for many years to come.

364. Major traffic routes are the main radial routes of the City, and the distributive arteries from the City to different parts of the Island. In many cases, existing roads are of sufficient width to deal with future traffic flows: this is the case with Serangoon Road, East Coast Road and the lower section of Thomson Road. In other cases, the existing line may in general suffice, but improvements are necessary to widen and in places straighten them to deal with estimated increase in road traffic: Changi Road, Upper Thomson Road and Ayer Rajah Road require such works. Finally, it is apparent that entirely new roads must be constructed in other places to deal adequately with likely future volumes: the new Kallang Bridge and Esplanade Road are prime examples of this. In addition a new road network of major traffic routes has been planned in connection with the development of Queenstown, a new radial route is to be constructed at Toa Payoh, and a new route is necessary between the City and areas to the west of the Island beyond Clementi Road. Map No. 12 illustrates these proposals.

365. Main thoroughfares are of appreciable traffic importance, connecting major traffic routes and lesser centres of population. In all cases they will follow existing lines of roads, with widening in certain places. It may be necessary in certain cases to limit parking along their length and restrict road access to them in order to facilitate traffic flow.

366. Other road proposals are dealt with in greater detail under Part II of this Chapter.

367. The parking problem is also one which demands urgent attention, but since this occurs primarily in the Central Area, it is also dealt with under Part II in relation to specific areas.

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*The total area of the Green Belt, including parks, playing fields, agricultural areas, the grounds of hospitals, schools and other institutions is 6,838 acres.

368. *Rail.*—The possibilities of improving rail transport have been considered in Chapter Ten. The Master Plan makes no specific proposals for rail improvements, but the matter will be kept under constant review.

369. *Water.*—The report of the Singapore River Working Committee has not yet been published but it is expected that it will propose firm measures for the improvement of that River for water traffic. The Master Plan recognises the importance to trade of the frontage to navigable stretches of the River, and incorporates the draft proposals of the Working Party which include the provision of 60-foot quays, and proper parking facilities for tongkangs.

370. The new bridge across the Kallang-Rochore estuary will limit the size of vessels which can pass upstream but will not interfere with the timber industry. The firewood industry at Crawford Street is being moved to the Geylang River where masted craft can be accommodated.

371. *Air Communications.*—The new airport nearing completion at Paya Lebar is shown on the Plan. Extent of control of height of buildings on airport approaches is shown by circles on the Plan, and control of development will have regard to these restrictions. Areas near runways are reserved for uses other than residential, since the noise of modern aircraft could be intolerable in such places. It is also important to reserve areas near the airport for uses ancillary to the expansion of this means of transportation. It is possible that the entrepot trade of Singapore will in the future expand considerably on this medium.

372. *Public Utility Services.*—The expected growth of population will impose increasing demands on all public utility services, and demands in particular areas must be forecast some years ahead so that adequate mains may be laid. In putting forward firm proposals for the distribution of population, the Master Plan assists in the fulfilment of public utility requirements on economical and efficient lines. The proposals shown on the Plan are the result of consultation with the departments concerned.

373. The main utility proposals include the possible establishment of a new *water* treatment plant on the west of the Island on a site not yet determined; the reservation at Ulu Bedok of a future water catchment area; the removal of the main *sewage disposal plant* to Jurong on a site indicated on the Plan; the construction of *new drainage canals* in Queenstown and elsewhere to cope with future flood waters; the possible construction of a new *gas works* on the west side of the City; and provision of sites for new *telephone exchanges*. In addition, the existing mains systems will be extended to supply the anticipated increases in population as foreshadowed in the Plan.

PART II

374. The general proposals of the Plan have now been described, and in this Part of the Chapter, reference is made to more detailed aspects of the Plan. This part of the report describes the plans themselves and reference should also be made to the Written Statement, which is formally submitted as part of the Plan.

THE CENTRAL AREA

375. The proposals for the Central Area of Singapore are shown on the Central Area Map and the stages of redevelopment on the Programme Map for this area. The main problems of the Area have already been summarised in Chapter Four and in paras. 324-331 where certain of the main proposals are also set out. The extent of planning districts and precincts in the Central Area is shown on Map No. 3. Existing population densities in this area are shown on Map No. 7 and an indication of existing land use on Map No. 8.

376. *Population and Density.*—Most of the precincts are at present residential in character, and are likely to remain so. At present, however, the population of the area is so high that the gross residential density over the whole area is 400 persons per acre, rising in certain areas to over 1,000 persons per acre. The Redevelopment Working Party recommended that the former density should be reduced during the period of the Plan to 300 persons an acre over the whole area, though it recognised that densities may in some areas reach 560 persons per acre where existing densities are very high. The proposals of the Master Plan aim at implementing this recommendation.

377. Even if this reduction in density takes place, the nature of redevelopment may be such that some residential precincts would comprise tall blocks of flats, some 15 storeys in height, surrounded by open space. Shops and offices would be permissible on lower floors, and within a block, or perhaps built separately, would be a primary school using part of the open space for games. The Redevelopment Working Party had before them a pilot scheme on these lines, and considered it reasonable and acceptable under the special circumstances.

378. The future population of the Central Area has been derived by the following method, which shows the way in which proposed future densities are related to those existing:—

(*a*) For areas which are proposed for comprehensive redevelopment, a density for future development has been worked out. This proposed density bears reference to the existing density and the need for some non-residential uses in the redeveloped area.

(*b*) For areas in which redevelopment is likely to take place by the reconstruction of individual block sections or buildings, a density has been calculated based on certain reductions taking place in the number of people likely to be rehoused in the area.

(*c*) For areas in which redevelopment is unlikely to take place owing to the recent nature of the buildings, it is assumed that very little change will take place in density.

379. Most precincts contain examples of each type of area. A careful analysis has been made of the redevelopment possibilities of each block within the precinct, and the average density figures for each precinct quoted in the cartograms on the Central Area Map are the sum of the results for each block. The maxima are in most cases the permissible densities for comprehensive redevelopment schemes. In all cases the existing figures are given for comparison.

380. *Roads.*—It has already been shown in paras. 251 and 252 that the worst traffic problems on the Island are met in the Central Area. An outline of the problems and a possible solution is also contained in these paragraphs. Maps Nos. 10 and 11 illustrate the traffic flow along the main routes.

381. The basis of the Central Area Plan is to provide a framework of major traffic routes of sufficient width to ensure that the expected volume of traffic will be able to move along them without congestion. In most cases, these routes will take the line of existing streets, widened in certain places, with limited points of access for other traffic and pedestrians, and with street parking prohibited along their length.

382. Of the routes running parallel to the coastline, three have been selected for this purpose north of the river—Selegie Road/Serangoon Road, North Bridge Road, and the new Esplanade Road—and two south of the river—South Bridge Road and Shenton Way. It is proposed that these routes should be intersected by several others which radiate from the Central Area: in particular Lavender Street/Crawford Street, Bukit Timah Road/Rochore Road, Bras Basah Road, Havelock Road and Outram Road. Junctions would be so designed to cater for future increased volumes of traffic.

383. These routes form the outline of the Central Planning Districts, within which a further sub-division by main thoroughfares and other roads contain precincts.

384. The survey has shown that a large proportion of the vehicles entering the Central Area are destined for the business heart of the City. This creates the necessity not only for taking special measures to ensure the smooth flow of traffic into, out from and within the area, but also to prepare far-reaching proposals for the likely increases in parked cars.

385. With the construction of the new Esplanade road to the East, and the completion of Shenton Way to the West, it is considered that all traffic flows will be adequately catered for along existing lines of streets—with one exception. The likely increases in traffic arising from the construction of the new ring road system at Queenstown and areas to the north will to a large extent funnel into Havelock Road which is at present of inadequate width. It is proposed that a new road should be constructed at a high level from Bukit Ho Swee onwards, reaching ground level again in the vicinity of Pekin Street. This proposal, which will involve an entirely new line, is shown on the Central Area Map.

386. The parking problems met in the Central Area have already been outlined in paragraphs 254-257 above. This is a problem which must increase in magnitude in future unless steps are taken to alleviate it. Such steps are of two kinds: positive and negative.

Of the positive steps, the most practical seems to be the establishment of multi-storey car parks in the central business area, and sites have been shown on the Plan for this purpose. A recent working party set up by the Planning Co-ordination Committee has reported on the feasibility of such a park on one of the sites shown on the Plan. A further step would be the establishment of car parks on the ring road containing the Central Area, whence an improved public transport system could bring passengers to and from the business heart of the City where central bus stations are to be provided. One such car park is shown on the Kallang aerodrome site, this being an experiment.

387. On the negative side, there is the necessity to limit growth of office floor space in the Central Areas to that which is actually likely to be required in this area over a 20 year period. This proposal is discussed in paragraph 389 *et seq.*

388. It must be noted that these proposals are based on the assumption that business will continue to expand in Singapore, and that the travelling habits of the public will remain unchanged. Careful watch will be kept with reference to the possibilities that may be opened up by the development of transport by helicopter, but as far as can be foreseen at present, they do not appear likely to lessen the traffic problem in the Central Area.

389. *Business.*—The importance of the business heart of the City has been fully recognised in preparing this Plan, and the proposals contained in it are aimed at disturbing the operations of this area as little as possible, whilst at the same time improving the efficiency of its communication system. The need for drastic measures in this connexion has been underlined by experience in certain American cities, where a virtual breakdown in the road communications system has led to a failure of the business area to perform its function satisfactorily—a condition only solved by the construction of enormously expensive road works.

390. The business areas in Singapore are at present highly centralised in the old commercial heart of the City. If, as business use increases with the growing population, it remains within the same acreage, it can be accommodated only by the erection of larger buildings in which greater numbers of people will work. To provide adequate means of access to and egress from the central business area, and parking space for vehicles within or near it, will become an increasingly greater problem. Having considered the likely future expansion in commercial population and the traffic access and parking problems attendant on it, it is proposed that a limit should be imposed on the size of further buildings in the central business area. The control suggested is on the basis of a maximum permissible "plot ratio" per site, i.e. the relationship between total floor area of the proposed building and its net site area. The control would be exercised differentially over the business zones according to the existing intensity of use, the highest plot ratio recommended being 5. The different ratios recommended have been chosen to allow for a certain increase in total office floor space.

391. *Godowns.*—The location of godowns is limited to the river and sea frontages, and to areas near main roads, by the need for easy access. The areas proposed for godown use in the Master Plan have been chosen accordingly and, in extent, permit a substantial increase in godown accommodation in the Central Area.

392. *Government.*—Administration of the increasing population will require extension of government use of land and additional areas for this purpose have been reserved on the Central Area Map.

393. *Main Shopping.*—Difficulty of access limits expansion of the main shopping centre in Raffles Place. Provision has been made for development of a new main shopping centre in Orchard Road. The feature of "through" shopping streets running from one end of the City to the other and served by rear access roads has been retained and, in fact, encouraged in the Plan, although it is expected that the minor establishments will be dealt with on redevelopment.

394. *Industry.*—All the main industrial uses, with few exceptions (including garages), lies to the east of the Central Area near Lavender Street and Kampong Bugis. These are retained in the Master Plan, Kampong Bugis being intended for development for noxious and noisy trades for which its insulated position is most appropriate.

395. *Waterfront: (a) Singapore River.*—The improvement of the Singapore River as a water traffic highway is receiving attention from the Singapore River Working Committee, whose provisional proposals are shown on the Master Plan. These proposals envisage the closure of an arm of the River at Pulau Saigon, and its reclamation for building, together with the reservation of a 60-foot access road and loading quay along almost the whole of both banks of the River from Cavenagh Bridge to Kim Seng Bridge to serve the godown areas.

(*b*) *Beach Road Reclamation.*—Development by permanent buildings of this area will follow the construction along the immediate sea front of a new main traffic route connecting Connaught Drive with the new bridge being built over the Kallang and Rochore estuaries. These proposals are those of the Kallang Basin and Aerodrome Redevelopment Committee which has agreed to the use of the present reclamation area for community, government, housing and open space purposes, with some commercial development. Also shown on the Master Plan is a proposal to reclaim further land off-shore for open space.

(*c*) *Telok Ayer.*—Use of this land has been under consideration for a long time: on the Master Plan it is shown used for those purposes which will fulfil long-felt local and Colony needs. These include an extension to S.A.T.A.'s premises, a Polytechnic Institution, schools, open space and a road layout designed to deal with expected traffic volumes hereabouts.

396. *Open Space.*—Against the existing provision of 0.31 acres of open space per 1,000 of the existing resident population in the Central Area, the Master Plan proposes a standard of 0.74 acres per 1,000 of the future population, a total of 234 acres in all.

397. In accordance with the definitions in Chapter Nine (q.v.), the total will comprise 115 acres of "town" open space, 100 acres of "district" or "precinctal" open space and some 19 acres of school playing space. Some of the additional open space will be obtained on development of new land, e.g. Beach Road and Telok Ayer, some during redevelopment and the remainder by further reclamation from the sea.

398. *Schools.*—There are about 20 acres of school playing space in the Central Area at the present time in addition to the land occupied by school buildings. The provision of additional schools is part of the programme of redevelopment and every effort will be made to provide play space near them.

399. *Summary.*—The Central Area of Singapore presents problems which are equal in magnitude to those in any similar area throughout the world, demanding a solution which will at once be acceptable to the 300,000 people who live there at present, and satisfy the growing civic pride in the City. The key to the whole problem is that of redevelopment, a vast and intricate process which must involve the uprooting of several thousands of people from their accustomed surroundings and, often, their mode of life. Some of these people must be encouraged to leave the Central Area altogether for areas where they can enjoy better living conditions, and it is in this respect that planning proposals for the Centre are most closely linked with those of the areas beyond—the Town Map and the Colony as a whole.

THE TOWN MAP AREA

400. The framework on which the Central Area proposals are based is the road pattern. On the Town Map, the roads are incidental to the general planning background. Here, the planning districts are the fundamental elements of the Plan. The methods employed in deriving these districts have been described already in Part I of this Chapter, and the paragraphs below contain brief notes on the proposals in each district.

401. *Population and Density.*—The present population of the area shown on the Town Map is 657,400. There are vacant lands in different parts of this area which are capable of being developed for housing purposes, and it has been estimated that, as a result of such development the 1972 population may reach 1,092,750.

402. The areas available for development vary greatly in extent, location and type. On the one hand there are the large S.I.T. projects for Queenstown and Toa Payoh, and major schemes for private development, low cost and otherwise; on the other hand there are large numbers of vacant plots within existing layouts. The 1972 population quoted above has been obtained by assigning net residential densities to each piece of vacant land, and so calculating the total population which could be accommodated. The densities vary between the different localities, and are in most cases based upon existing densities which are also quoted in the cartograms on the Town Map.

403. The chief form of redevelopment likely to take place in the Town Map Area is that which concerns areas of temporary housing, or attaps.

404. The extent of the Urban Planning Districts is shown on Map No. 2. Existing population densities are shown on Map No. 6.

Urban Planning District No. 1—Tiong Bahru—Town Map

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	38,800	59,600	98,400	18.3	6.7	0.8
1972	...	101,650	101,650	85.1	43.4	11.5

405. Existing development comprises the S.I.T. Estates at Alexandra Road and Tiong Bahru, scattered industrial establishments, and large areas of temporary housing (plank and attap) in which general conditions are appalling.

406. Future proposals call for the clearance of these "attap" areas and their redevelopment by the Singapore Improvement Trust or some similar authority. Adequate reservations are made for community facilities which include additional sites for 13 primary and 4 secondary schools. The areas for schools given in the accompanying table do not include land reserved in the adjoining Telok Blangah and Queenstown planning districts for 1 primary and 1 secondary school and school playing fields. Other major proposals are the conversion of the existing sewage farmland to use as schools and public open space, the development of one of the disused cemeteries into a public park and an industrial reservation along the railway line on the southern boundary.

Urban Planning District No. 2—Telok Blangah

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	10,100	8,700	18,800	27.3	...	0.5
1972	9,400	15,800	25,200	47.4	159.6	3.3

407. Large parts of this district consist of H.M. Forces' land, while the Railway Station and yards and other ancillary buildings also occupy a significant area. Residential development comprises mainly staff quarters of the Singapore Harbour Board, the Malayan Railways and other public authorities. There are a few scattered industries with a concentration of godowns at Sibu Road area. Attap development is confined mainly to the Silat Road area, along the railway line on the northern boundary and at 4th mile, Telok Blangah Road.

408. Future proposals include the reservation of about 155 acres of the hilly ground north of Telok Blangah Road for a public park. The site commands a magnificent view of the sea.

409. The attap development in this district is not sufficiently bad to merit redevelopment, but this may occur in places as private developers build permanently.

410. Additional reservations of land have been provided to consolidate and round off existing industrial development. Additional sites for 3 primary schools and community centres are also reserved.

Urban Planning District No. 3—Orchard Road

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	2,500	51,500	54,000	36.6	36.9	0.7
1972	...	84,650	84,650	93.8	57.9	11.0

411. This is a fairly built-up district adjoining the Central Area, yet preserving a suburban character in many localities. The development along Orchard Road with its shops, offices and showrooms is a continuation of the central urban development, and future proposals provide for its expansion into a main shopping centre.

412. Residential development falls under three categories, viz. "flat" in the Farrer Park area, a good low-density residential area near Cairnhill Road and another good low-density residential area about Oxley Rise. These areas are being gradually transformed by higher-density buildings.

413. Future development will be mainly infilling, and provisions are made for the preservation of the open character in the Cairnhill Road area while allowing for higher density development in the other residential areas.

414. Major proposals comprise the layout of a high density residential estate by private enterprise on the cemetery land south of Orchard Road in its upper part, the conversion of the disused Christian Cemetery at Bukit Timah/Thomson Road into a public park, which is much needed in addition to the immensely popular Farrer Park.

415. Sites are also reserved for an additional 13 primary schools and one secondary school centred mainly round two large school campuses at Kim Seng Road and Monks Hill to serve not only this district but also parts of the Central Area.

Urban Planning District No. 4—Toa Payoh

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	25,180	38,820	64,000	69.1	6.5	0.5
1972	2,500	128,850	131,350	182.8	129.7	5.5

416. Most of the permanent buildings are concentrated in the southern part of the district, in the Balestier Road area, where there is a mixture of dwellings, industry, shops and businesses. North of this is the large "attap" area of Toa Payoh, which contains some of the best farmland in the Colony.

417. It is envisaged that a large part of the "attap" area will be developed as a suburb along the lines of Queenstown, and would incorporate the St. Michael's Wireless Station site when that installation is removed.

418. Reservations are provided for the future extension of Tan Tock Seng Hospital as well as for a new District Hospital on 4½ m.s. Thomson Road. Sites for an additional 17 primary and 5 secondary schools, and for other community facilities are also reserved.

419. The open farmland along the periphery of the northern boundary is zoned as Green Belt, and an important new road is planned to traverse the district, connecting Thomson and Upper Serangoon Roads.

Urban Planning District No. 5—Queenstown

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	9,400	600	10,000	...	1.4	0.1
1972	300	77,550	77,850	106.1	84.2	10.1

420. Except for temporary huts, this district is largely undeveloped but work has commenced on the development of a new satellite suburb, Queenstown.

421. Queenstown will cover a greater part of the district, and will have four neighbourhoods each with its full complement of schools, open space, and community facilities. This area is also to be traversed by new radial and ring roads which will contribute greatly to the ease of movement of traffic from the Bukit Timah area and the centre.

422. An area of about 176 acres close to the railway line is zoned for industries, and is continuous with the industrial area on the south in the Tiong Bahru Planning District.

423. Sites are also reserved for a Junior Technical School and a District Hospital, and include reservations for 12 primary and 5 secondary schools.

Urban Planning District No. 6—Whitley

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	4,500	5,000	9,500	13.0	...	...
1972	1,500	16,700	18,200	27.8	22.5	0.8

424. This is a pleasant low-density residential district lying north of Dunearn Road and traversed by Whitley Road, much of which is yet undeveloped. Temporary huts occupy a considerable area but are being gradually displaced by modern low-density housing, a process which is expected to continue in the future.

425. Although the need for community facilities such as schools, open space and community facilities is negligible for the district, reservations for 3 primary and 1 secondary schools and for a public park are provided partially to relieve the pressing need for such facilities in the adjoining Orchard Road planning district.

Urban Planning District No. 7—Dunearn

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	2,740	960	3,700	1.9	...	...
1972	950	15,200	16,150	58.7	5.0	1.0

426. The character of the residential development is similar to the adjoining Whitley planning district, comprising bungalows standing on spacious grounds. The Singapore Turf Club and the Singapore Golf Club occupy large areas, and the catchment reserve lies on the northern boundary.

427. Much of the land is undeveloped, with squatters carrying on market gardening in low-lying areas.

428. Future proposals anticipate the extension of the existing open development, necessary reservations being made for community facilities and include sites for 2 primary and 3 secondary schools.

429. Major proposals are the new Raffles Boys' and Girls' Schools which will serve the City as a whole.

Urban Planning District No. 8—Holland (N)

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	10,200	4,000	14,200	83.7	2.2	1.2
1972	22,300	41,000	63,300	130.3	22.2	8.8

430. This outlying area, where built-up, is occupied by bungalows in very large grounds. But much of the land is as yet undeveloped with temporary huts scattered over a wide area. Some vegetable gardening is carried on.

431. In some parts, particularly south-west of the railway line, it is expected that this temporary development will remain, and indeed might be encouraged if properly planned, being capable of considerable infilling; however, if the area be developed along similar lines to Queenstown, the area will accommodate a greater number of people than is possible with temporary housing.

432. It is expected that the existing bungalow development will extend over large parts of the area as indicated on the Plan.

433. Adequate reservations for community facilities are provided, and include sites for an additional 10 primary schools and 1 secondary school.

Urban Planning District No. 9—Tanglin

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	1,200	21,200	22,400	...	74.0	0.2
1972	...	39,750	39,750	13.4	74.0	0.2

434. This district comprises mainly the bungalow area as specified in the City By-laws. The presence of the Botanic Gardens and the University of Malaya with their finely kept grounds add much to the amenity of the district.

435. Future proposals provide for the preservation of the open development in keeping with the general character of the district.

436. There is little apparent need for community facilities, but a site is reserved for a secondary and primary school.

Urban Planning District No. 10—Pasir Panjang

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	5,800	4,100	9,900	8.7	...	0.2
1972	4,350	8,500	12,850	18.5	22.0	6.4

437. This elongated district is sandwiched between the sea on one side and H.M. Forces land on the other. Bungalows are scattered along the length of Pasir Panjang Road with attap settlements interspersed. There is also a concentration of industrial establishments in the south-eastern part of the district.

438. Future proposals aim at extending residential development at medium densities while retaining parts of the attap settlements where there is room for considerable infilling.

439. The elongated nature of the district is such that two shopping centres are required, and provision is made for the expansion of the existing centres at Pasir Panjang/Buona Vista Roads, and Pasir Panjang/Clementi Roads.

440. Two public parks, one at the Gap, and the other near the shopping centre at Buona Vista Road, are proposed. The former will serve the City as a whole while the latter is a Rural Board project, and will serve the district, incorporating health and community centres. Both the parks are outside the district.

441. Provision is made for an additional primary and secondary school, and land round the existing industries are zoned for industrial expansion.

Urban Planning District No. 11—Bukit Timah

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	5,800	6,200	12,000	3.8	...	0.2
1972	18,500	36,400	54,900	62.3	170.5	8.2

442. The district is at present mainly rural in character except for several groups of bungalows, and a group of factories along Bukit Timah Road. The nucleus of the district is the expanding Bukit Timah Village lying at the cross roads of Jurong and Bukit Timah Roads.

443. Future proposals envisage the development of a self-contained district with its full complement of industries, community facilities and shops. A by-pass is proposed for Bukit Timah Road at this junction, which will take through traffic off the present Bukit Timah Road passing through the district centre.

444. It is proposed that future residential development will be at medium density of a maximum of 75 p.p.a., with infilling and expansion of existing bungalow areas in certain places to a maximum of 50 p.p.a.

445. It is anticipated that a considerable area of land at present occupied by agricultural holdings and attap settlement will continue to be so used, and is indeed capable of some infilling to provide additional sites for "attaps".

446. Major development proposals provide for community buildings and a large public park at Bukit Batok, the latter serving the City as a whole. Provision is also made for an additional 3 primary and 8 secondary schools.

Urban Planning District No. 12—Thomson

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	5,500	...	5,500	...	1.0	...
1972	500	28,350	28,850	27.2	99.7	6.7

447. This is another district which is at present mainly rural in character, but which will gradually become transformed into a residential suburb.

448. In order to encourage local traffic off Upper Thomson Road, it is proposed that an internal spine road should be constructed as shown on the plan. A Central Area will be developed to contain adequate facilities for future population.

Urban Planning District No. 13—Paya Lebar

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	45,600	12,600	58,200	27.0	1.2	0.3
1972	41,800	64,200	106,000	124.2	46.2	8.0

449. This is primarily a dormitory suburb to the City with two local shopping centres at Yio Chu Kang/Upper Serangoon Road, and Tampenis/Upper Serangoon Road. In the outlying parts, there is open bungalow development but more compact development lies along the northern side of Upper Serangoon Road between Yio Chu Kang Road and Lim Ah Pin Road, and in the expanding Serangoon Garden Estate. There are extensive attap areas, with a heavy concentration around Chia Keng Village and on the southern side of Upper Serangoon Road. Parts of the district are occupied by coconut plantations, and some market gardening is carried on. Most of the people living here are employed outside the district.

450. Future proposals provide for the infilling and consolidation of existing bungalow development, the completion of Serangoon Garden Estate, and its expansion southwards. Many of the attap areas are likely to remain as such, and, if properly planned, could absorb many more huts. It is also proposed that a new road link should be constructed, which will allow Yio Chu Kang—Singapore traffic to avoid the present bad bottleneck at the junction of Yio Chu Kang and Serangoon Roads.

Urban Planning District No. 14—Aljunied Road

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	12,700	11,400	24,100	53.9	...	...
1972	3,800	49,200	53,000	102.4	16.1	8.8

451. This is a fast growing residential suburb, most of the building having been completed during recent years. The existing vacant land is mainly scheduled for residential development by private enterprise as well as public authorities.

452. Future proposals provide for an industrial zone south of Macpherson Road and west of Aljunied Road, which will gradually develop as private firms are directed onto this land. A Green Belt is also proposed to separate this district from adjoining one.

453. Community facilities include a site for a District Hospital and for an additional 12 primary and 2 secondary schools. Many of the City's cemeteries are located in this district, and this contributes much to its open appearance. These will, of course, remain.

Urban Planning District No. 15—Geylang

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	50,000	75,300	125,300	108.7	18.8	0.7
1972	19,750	124,400	144,150	187.3	258.9	13.8

454. Much of this scattered semi-urban district consists of good low-density residential bungalows particularly along the sea frontage. Development along Geylang Road is an extension of the urban influence with shops on both sides of the road and residences behind. Mixed development comprising of inferior housing small factories and squatter huts are fairly extensive in some localities.

455. This district contains one of the main "problem" areas of the City, i.e., the Kallang Basin. Due to the fact that decisions had to be made on the use of the land at present occupied by the aerodrome, and on the reclamation of swampland in the basin itself, Sir John Nicoll set up an *ad-hoc* committee, whose interim proposals have already been published by Government. These include the partial use of the aerodrome as a large open space, the remainder to be built up by the Singapore Improvement Trust for housing. The new Esplanade road also stems from this Committee's deliberations, made necessary by traffic congestion on Kallang Road. Finally, a scheme for filling the swamplands in the basin, rendering them suitable for factory land, is at present under consideration. It is proposed that the filling materials should be obtained from Jalan Eunos quarry, and a new road constructed for the use of earthmoving machines. This road is shown on the plan (partially in Planning District No. 16 also) as it will ultimately become available for general use.

456. Parts of the district in the Joo Chiat Road area contain old and semi-dilapidated dwellings, and it may be necessary later to submit a Central Area Map for it, containing redevelopment proposals.

457. There are several flourishing shopping centres, which the Plan retains, and in places, extends. In addition, a new town centre is proposed on the extension westwards of Dunman Road, and firm plans are being formulated for many community buildings there including a community centre, post office, and labour exchange.

458. Elsewhere, future development will be mainly infilling on vacant land, and the completion of partially built-up housing estates. Much of the attap development along the Green Belt in the northern boundary might remain, provided it is satisfactorily planned.

Urban Planning District No. 16—Malay Settlement

Date	Population			Schools	Public Open Space	Community Buildings
	Temporary	Permanent	Total	(acres)	(acres)	(acres)
1953	17,000	5,700	22,700	4.6	1.2	...
1972	21,550	21,000	42,550	50.9	21.2	7.0

459. The dwellings in this district are constructed mainly of temporary materials. The main centres are at Geylang Serai and the Malay Settlement at Jalan Eunos. While the former has deteriorated into semi-slums owing to its close proximity to the City, the latter still preserves the pleasant atmosphere of a Malay kampong.

460. Some permanent dwellings developments are located along Jalan Eunos south of the Malay Settlement, and is scattered in other parts of the district.

461. Future proposals aim at the retention of much attap development within which some infilling is possible. The development and expansion of the Jalan Eunos locality along more permanent lines is also proposed.

462. A large area on the north of the Planning District is reserve land, its use yet to be determined.

THE COLONY MAP AREA

463. The proposals on the Colony Map are not indicated in the same detail as those on the Town and Central Area Maps. Frequently, they are shown as symbols in localities where facilities are required, or where certain types of settlement are to be located. In some cases, mentioned in paragraph 470 below, it is intended that there shall be more detailed plans prepared at a later stage.

464. *Population.*—Whilst more than half of the expected 1972 population of the Colony would be accommodated within the Town Map and Central Areas, it is only by extensive development of parts of the rural area beyond the Green Belt, that all might be housed. It is proposed that this development in the rural areas should take the following forms:—

(*a*) the planned growth of existing villages;
(*b*) resettlement schemes for attap dwellers including farmers who have agreed to move out from the urban area;
(*c*) the construction of new, self-sufficient towns.

465. The dispersal of population in these ways would combat the present dual tendencies towards centralisation and urban sprawl.

466. The rural area has been divided into 11 Rural Planning Districts, which differ considerably in area and population. In each district, rural centres have been chosen where facilities now lacking in rural areas, e.g. schools, clinics and community centres, should be provided in future. The existence of such facilities, or the intention to provide them in future, is shown by means of a symbol against each rural settlement. The dispersal of population to rural areas would render these facilities more urgently necessary than they are now.

467. Apart from H.M. Forces' establishments, existing settlements in rural areas are mostly agricultural or fishing villages, though pockets or urban development are found on main roads. To maintain the supply of fresh farm produce, large areas of farmland have been shown on the Master Plan. These comprise either first class land already heavily cultivated which should not be built upon, or land with high potential agricultural value. All proposals for the alienation of this land will in the first instance be referred to Government agricultural officers, with whose assistance the land has been delineated. Farmers will be encouraged to settle in these areas, some of which will be settled in pursuance of rural resettlement schemes.

468. The fishing industry is important to the Colony as a source of food supply. With the growth of population, the industry should grow and, in consultation with Fisheries Officers, land has been reserved at and near fishing villages to permit their extension.

469. In the same way as the City would be contained by its Green Belt, it is proposed that rural settlements shall be limited in size. This applies particularly to urban settlements like Bukit Panjang and Nee Soon which, unless controlled, would spread along main roads until all semblance of soherent communities departed and, in addition, a traffic problem emerged.

470. It is suggested that these urban areas, and the semi-urban areas on the east side of the Island between Bedok and Changi, should be the subject of more detailed plans to be submitted as additional Town Maps in the near future. Ultimately village plans should be prepared for each village.

471. *New Towns.*—The construction of new towns is, apart from the redevelopment proposals, the most ambitious suggestion of the Master Plan. It is considered that only in this way can the future population be accommodated without increasing the existing planning problems in the City. Not only would new town provide homes but, with land reserved for industry and commerce, they would also relieve the heavy demand for such land in the existing urban area. It is important that these towns should be well removed from the City so that no possibility of their being joined by urban development at a later stage could be entertained. However, they would draw life from the City and good communications with it are an essential feature of the Plan. The creation of the new towns must be on a comprehensive scale with the provision of places

of work, worship and entertainment. schools, roads and public utility services progressing hand-in-hand with the construction of homes. The preference for the amenities of town life is strong among local people and such amenities must be provided to attract population to new settlements.

472. It is recognised that the establishment of New Towns will make considerable demands upon the resources of finance, building manpower and building materials of the Colony: this matter is dealt with in greater detail in Chapter Thirteen. Nevertheless, experience elsewhere has shown that New Towns are a practical proposition, provided that the establishment of means of livelihood, schools and community facilities proceeds at a sufficient rate to keep pace with the increase of population within them. The example of Petaling Jaya near Kuala Lumpur gives added weight to this contention, and the Queenstown project is providing valuable experience in the establishment of largely self-contained communities in Singapore.

473. The proposals in the Master Plan made provision for three new towns in the vicinities of Woodlands, Bulim and the junction of Upper Thomson and Yio Chu Kang Roads respectively, and for two new urban areas in the vicinities of Bedok-Changi and Bukit Panjang. It is not expected that building work on the new towns would start until the Queenstown and Toa Payoh projects were well under way, but such is the length of time necessary for preparatory work of all kinds that an immediate start must be made on these projects on the drawing board, in preliminary discussions and on the sites. Development of the urban sites at Bedok-Changi and Bukit Panjang is likely to be undertaken primarily by private developers. The proposed 1972 populations and acreages of the new towns are set out below:—

	Population	*Acreage*
Woodlands	80,000	3,000
Bulim	85,000	3,000
Yio Chu Kang	35,000	1,000
	200,000	

474. *The Islands.*—Such islands around Singapore as are habitable are being put to good use and the Master Plan makes no proposals to change their use at present. Reserves of land for fishing centres are made on Pulau Ubin, Pulau Tekong Besar and on the islands to the South-west (Merlimau, etc.). The improvement of community facilities and public utility services on the islands is already in hand. The possibility of developing one or more islands for recreation is worthy of further consideration, and it is intended to submit further proposals in due course.

CHAPTER THIRTEEN

REALISATION AND IMPLEMENTATION

Realisation

475. The preceding chapter has summarised the proposals contained in the Master Plan. Many of the proposals which are fundamental to the Plan involve works and building such as the establishment of industrial estates, the construction of houses, the redevelopment of the Central Area, the provision of community facilities, the construction of new roads and the improvement of existing ones and the development of new towns.

476. The realisation of these proposals and of the many minor ones proposed in the Plan depends on availability of money, labour and materials: without these, the Plan cannot be implemented. The purpose of this part of the Chapter is to review the resources of the Colony with the provisions of the Master Plan in view.

477. Before commenting on money, labour and materials individually, two important points must be made:—

(*a*) that unless all three resources are available for both public and private enterprise, not only as at present but augmented to keep step with the needs of the rapidly growing population, Singapore cannot maintain, let alone increase, its present status;

(*b*) that the Plan itself will not cause more money, labour and materials to be expended but, on the contrary, will prove an economy, for development and redevelopment will in any case proceed. If they proceed in an unco-ordinated and sporadic manner, waste and confusion are inevitable. On the other hand, if they proceed in accordance with a flexible plan which contains as one of its essentials a realisable programme which can be implemented stage by stage, each operation will be co-ordinated and directed towards a common aim, namely the well-being and prosperity of the people of Singapore. Waste and confusion will thereby be avoided.

478. The programme for the realisation of the Master Plan is based on a projection of current resources; it has been drawn up on the assumption that adequate resources will become, or be made, available in the stages when they are required.

Finance

479. It is considered beyond the scope of this Report to comment on the effect that the Master Plan will have on the finances of the Colony. It is felt, however, that this subject should be discussed at a high level with all interested parties, after the Master Plan has been presented but before its final approval by Government, and that the Team should be represented at such discussions. In regard to finance generally, it may be said at this stage that all proposals for development by Government departments have been based on a fair assessment of what may be achieved at each stage, with the expenditure over the past years used as a guide. Similarly, other proposals have been related broadly to the financial resources of the Colony.

480. The estimated programmes of capital expenditure on public works by Government departments (including such items as schools and the new Civil Airport), the City Council, the Rural Board, the Singapore Improvement Trust and the Singapore Harbour Board have all been examined by the Team. Programmes include, *inter alia*, expenditure on housing, roads and bridges, drainage and redevelopment.

481. Certain of the proposals, particularly the establishment of new towns, will attract capital outlay and necessitate the expenditure of funds which otherwise would have been dissipated on sporadic development, but this outlay must be measured against the enormous benefit which the population will derive from them. In spite of the heavy expenditure, the Team is convinced of their necessity and, moreover, that the Colony can and must afford them.

Labour and Materials

482. With the aid of the Director of Commerce and Industry, a Building Resources Study Group, representative of the Colony's whole building industry, was set up in 1952 to examine the supply of, and demand for, building labour and materials. The report of the Group, which has been forwarded to Government, is contained in the companion volume *Reports of Study Groups and Working Parties*.

483. The Study Group found that in 1952 the Colony's building contractors employed about 10,000 persons and that the direct labour forces of public authorities, including H.M. Forces, employed about 4,000 more. This labour force is engaged on the erection of residential, public, commercial and industrial buildings, and maintenance and repair works. The Study Group has carefully analysed the work done by units of the building labour force on different kinds of building.

484. In Chapter Seven on Housing, the need to increase the housing rate to at least 10,000 new homes a year has been shown. On certain assumptions (such as the proportion of bungalows, terrace-houses and flats which would comprise the total housing effort) the Study Group has estimated that an additional labour force of 3,600 skilled or partly skilled building workers would need to be recruited to reach this housing rate, and about 1,500 more unskilled workers would also be required. A further additional labour force would be needed for the construction of roads, drains, sewers, etc., and for the erection of the shops, schools and places of work and entertainment which would also be required. The Study Group has therefore recommended means of increasing the building labour force.

485. The Group also studied the supply of basic building materials and concluded that unless long-term plans for supply were made in respect of steel and other imported materials, a major housing effort might be delayed by shortages.

486. It has already been demonstrated that a major problem in planning Singapore is to provide for its rapid increase in population, and one of the major uses to which the Master Plan, proposes that land should be devoted is housing. To realise the minimum housing rates envisaged in the Plan, i.e. 10,000 homes a year, the supply of both skilled and unskilled labour and of materials must be augmented. *Implementation of the Study Group's recommendations, or of satisfactory alternatives, is therefore essential to the realisation of the Master Plan.*

IMPLEMENTATION

487. As already noted, the effect of the Plan will be to co-ordinate all the separate operations of both public and private enterprise in an advance to a common goal. The process of implementation involves the indication on the Plan of the approximate order of priority of each of the proposals in relation to the service they should render to the community and to the efficiency of the Colony, and the steady realisation of its proposals through the medium of day-to-day control of private development. This part of the Chapter deals generally with each of these aspects.

Priorities

488. The proposed priorities for the carrying out of proposals, where they can be stated with any certainty, are indicated on the Programme Maps which accompany the Master Plan, and in the Written Statement. In general, top priority has been allocated to proposals which are already in an active stage of preparation in the Departments concerned, often in consultation with the Team, or which the Team consider to be the most urgent, having fully discussed the implications with the relevant authorities. Details of these priorities are to be found in Part II of the Written Statement.

489. The proposals outlined on the Central Area Programme Map are the most far-reaching in this connection. As indicated in Chapter Twelve, a carefully designed programme of redevelopment is put forward, based on the present age and condition of properties in the Central Area. The amount of work required to implement each phase of this programme has been related to the assumed future resources of the Colony, bearing in mind the other proposals of the Plan.

490. The establishment of New Towns is a necessary corollary to this redevelopment. In this connection, priority is given to the New Town in the vicinity of Woodlands, mainly because of its good road and rail access and because all public services other than drainage are available there.

491. It should be noted that before the construction of any large project such as a new town or a large new settlement can be begun, an immense amount of preparatory work has to be undertaken. Apart from the detailed survey of the site and the preparation of the plans, squatters will have to be moved elsewhere, some approach roads constructed, land drainage works undertaken, and the supply of public utility services (particularly that of water in the western part of the Island) improved. It seems obvious that the Singapore Improvement Trust is the authority to initiate such projects, and it is manifest that it should be given sanction to proceed and that the land should be purchased

some years ahead of the date when buildings will be required on the site to accommodate the increasing population and those who will be given the opportunity to move out from the overcrowded centres and be provided with the means of livelihood near their homes.

Development Control

492. The Master Plan provides a land pattern for development by both public and private enterprise, but whereas public works and most of the housing for their own employees or for the low-income groups are likely to be carried out by public bodies, the field for private enterprise will in the future, as in the past, be a big one and a large part of the Master Plan will be carried out by this form of development.

493. The pattern laid down by the Master Plan sets aside certain areas for the uses appropriate to them which can be exercised without interference from, or interference with, the uses prescribed for other areas. Appropriate densities of resident population are also prescribed.

494. Any person wishing to develop will therefore find in the Master Plan a guide to the form of development appropriate to the area in which he wishes to develop. Moreover, he will find in the Tables in Part III of the Written Statement, which forms part of the Master Plan, lists of uses freely permissible, or not allowed, or allowed subject to special consideration, i.e., that although not normally permissible, special circumstances will be considered and such consideration may result in permission being given, probably subject to conditions.

495. Part III of the Written Statement also contains certain Regulations and interpretations to facilitate and explain the control of the erection and use of land and buildings.

496. Intending developers will, of course, have to obtain the written permission of the Singapore Improvement Trust, or such other authority as in future exercises planning powers, to their proposals just as they do now, but in future they will have the advantage of the guidance of the Master Plan to which the Trust will have regard when considering such applications.

CONCLUSION

497. The framing of a Master Plan for an area such as the Island of Singapore, if it is to give adequate expression to the needs of the people, is a complex operation. The foregoing chapters have summarised the work carried out by the Team in an attempt to achieve this end, and have outlined the Team's proposals. During the preparation of the Plan, the Team has established a very valuable system of consultation with Government departments and other interested bodies either directly or through the medium of the Planning Co-ordination Committee. It is essential if the Master Plan is to be implemented that this co-ordination should continue. The gradual implementation of policies and the testing of standards and results has also proceeded during the preparation of the Plan. The work of the Planning Department of the Singapore Improvement Trust has been of vital importance in this respect.

498. Nevertheless, the full scope of the benefits which could result from the Master Plan will only be realised if full expression is given through the medium of Government policy to the major proposals of the Plan. The Master Plan indicates what should be done: it rests with the people of Singapore, by the use of the energy and enterprise patent in the history of this settlement, to decide what shall be done.

REPORT OF SURVEY

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ACKNOWLEDGEMENTS

During the preparation of the diagnostic survey and Master Plan, the Team has received the advice and co-operation of many people in Singapore. The list of persons, or groups of persons, given below comprises those whose knowledge, work and co-operation have contributed most vitally to the preparation of the Master Plan. To these, and to the many who have helped in any degree, the Team expresses its deep appreciation:—

Sir George L. Pepler, C.B., who was appointed in 1951 as Town Planning Adviser to the Colony, and under whose general direction and guidance the main part of the work has been undertaken.

Mr. J. M. Fraser, C.B.E., the Manager of the Singapore Improvement Trust, whose advice and guidance has been available during the whole period of preparation of the Survey and Plan.

Mr. F. E. A. B. Sewell, the Chief Planner of the Singapore Improvement Trust, and officers of his department, for their continuing co-operation and assistance.

Members of all Study Groups and Working Parties in connection with the Diagnostic Survey and Master Plan, whose names are listed in the reports submitted in an accompanying volume.

Dr. F. E. S. Alexander, late of the University of Malaya.

Dr. E. H. G. Dobby, Dean of Arts, University of Malaya.

Mr. B. W. Hodder, Lecturer of the Department of Geography and students of that department who took part in the surveys of land use.

Miss Jean Robertson, Senior Lecturer of the Department of Social Studies, University of Malaya. Mrs. Wee and Mr. Wells, Lecturers in that department, and students who took part in the design and execution of the social survey.

Mr. Price, Principal of the Teachers' Training College, Singapore, Mr. Devan, the Registrar, and students who assisted in field work.

Mr. Howitt, Principal of Raffles Institution, members of his staff and students who assisted in the Industrial Survey.

Students of other faculties of the University of Malaya who assisted in field work, particularly the Attap Survey.

Principals, staffs and students of many schools in Singapore who participated in the Traffic Census.

Representatives of Trade Associations and firms who, together with numerous individuals gave information and advice in connection with the surveys of industrial and building resources.

Officers of all departments of central and local government, whose work over many years has provided essential material for the Master Plan, and whose co-operation was always generously given.

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The following officers have been members of the Team during part or all of the preparation of the Diagnostic Survey and Master Plan:—

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MAP
OF
THE TOWN & ENVIRONS
OF
SINGAPORE,
Drawn by J.T. Thomson
from an actual Survey
by
G.D. COLEMAN

Gambier Plantations

Paddy

Fields

Gardens

Chinese Vegetable Gardens

Brick Kilns

Bugis Village

Kelang River

Paddy Fields

Sand and Mud at low water

Mangrove Swamps

Marsh

Marsh

Marsh

MAP NO. 1

I JURONG

II WEST COAST

III BUKIT PANJANG

IV BUKIT TIMAH RURAL

V NEE SOON

VI YIO CHU KANG

VII SERANGOON

VIII KIM CHUAN

IX ULU BEDOK

X CHANGI

XI BEDOK

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

RURAL PLANNING DISTRICTS

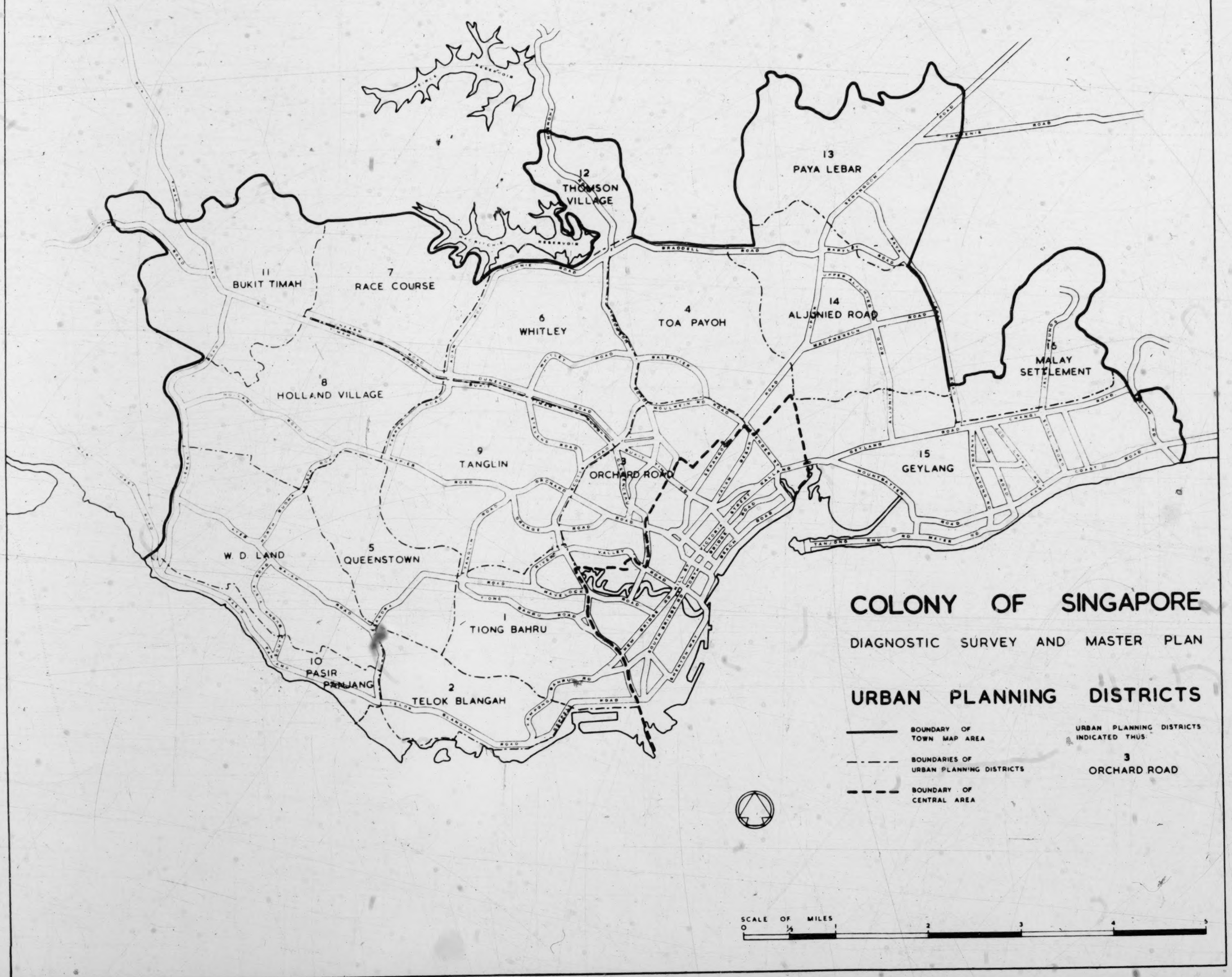
BOUNDARY OF TOWN MAP AREA

BOUNDARIES OF RURAL PLANNING DISTRICTS

RURAL PLANNING DISTRICTS INDICATED THUS VI — YIO CHU KANG

SCALE OF MILES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

MAP NO. 2



COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

URBAN PLANNING DISTRICTS

BOUNDARY OF TOWN MAP AREA

BOUNDARIES OF URBAN PLANNING DISTRICTS

BOUNDARY OF CENTRAL AREA

URBAN PLANNING DISTRICTS INDICATED THUS:

3
ORCHARD ROAD

SCALE OF MILES
0 ½ 1 2 3 4 5

MAP NO 3

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

CENTRAL PLANNING DISTRICTS

BOUNDARY OF CENTRAL PLANNING AREA

BOUNDARY OF CENTRAL AREA (REDEVELOPMENT)

BOUNDARIES OF CENTRAL PLANNING DISTRICTS

BOUNDARIES OF PRECINCTS

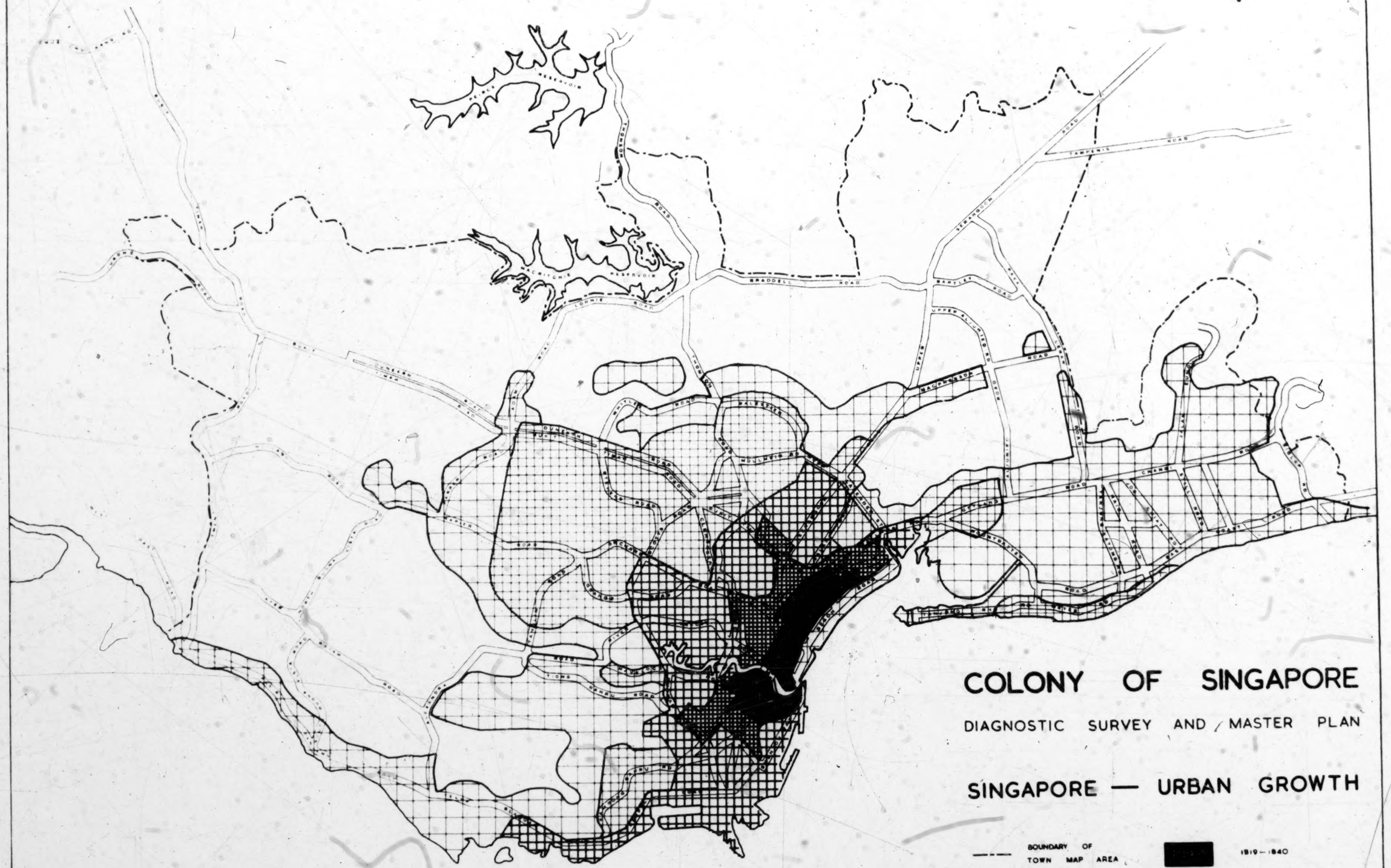
CENTRAL PLANNING DISTRICTS AND PRECINCTS INDICATED THUS:

H2

SCALE OF MILES

0 ¼ ½ 1 1½

MAP NO. 4



COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

SINGAPORE — URBAN GROWTH

BOUNDARY OF TOWN MAP AREA

1819 – 1840

1840 – 1860

1860 – 1890

1890 – 1920

1920 – 1950

SCALE OF MILES

0 ½ 1 2 3 4 5

MAP NO. 5

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

RURAL POPULATION DISTRIBUTION

1953

BOUNDARY OF TOWN MAP AREA

EACH DOT REPRESENTS 25 PEOPLE

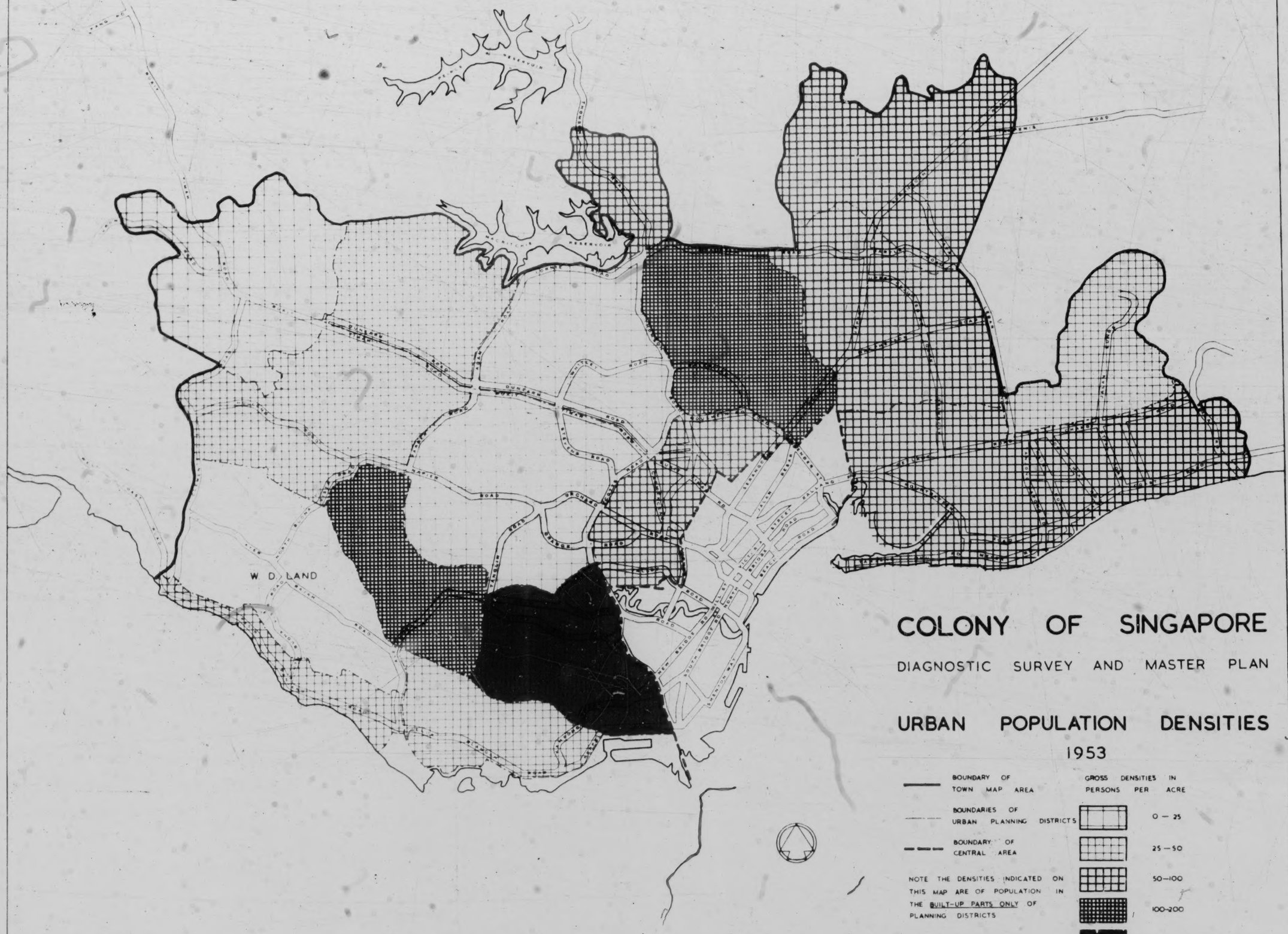
SIZE OF SETTLEMENTS

- 4000 AND ABOVE
- 2000 – 4000
- 1000 – 2000
- 500 – 999
- 0 – 499

SCALE OF MILES

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

MAP NO. 6



COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

URBAN POPULATION DENSITIES

1953

BOUNDARY OF TOWN MAP AREA

BOUNDARIES OF URBAN PLANNING DISTRICTS

BOUNDARY OF CENTRAL AREA

NOTE THE DENSITIES INDICATED ON THIS MAP ARE OF POPULATION IN THE BUILT-UP PARTS ONLY OF PLANNING DISTRICTS

GROSS DENSITIES IN PERSONS PER ACRE

0 — 25

25 — 50

50—100

100-200

200 AND ABOVE

MAP NO. 7

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

CENTRAL POPULATION DENSITIES

1953

BOUNDARY OF CENTRAL AREA

GROSS DENSITIES IN PERSONS PER ACRE

- 0 — 100
- 100 — 200
- 200 — 300
- 300 — 400
- 400 — 500
- 500 AND ABOVE

SCALE OF MILES

0 ¼ ½ ¾ 1 1½ 2

MAP NO. 8

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

EXISTING LAND USE — CENTRAL AREA

BOUNDARY OF CENTRAL PLANNING AREA

RESIDENTIAL

INDUSTRIAL & GODOWN

COMMERCIAL

ADMINISTRATIVE

COMMUNITY

MILITARY

OPEN SPACE

MAIN SHOPPING FRONTAGE

SCALE OF MILES

0 ¼ ½ 1 2

MAP NO. 9

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

OPEN SPACE

- CATCHMENT AREA
- NATURE RESERVE
- EXISTING MAJOR PRIVATE OPEN SPACE
- EXISTING MAJOR PUBLIC OPEN SPACE
- PROPOSED GREEN BELT
- MINOR OPEN SPACE PUBLIC AND PRIVATE
- PROPOSED MAJOR PUBLIC OPEN SPACE

SCALE OF MILES

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

JUNE 1954 REVISED JUNE 1955

MAP NO. 10

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

TRAFFIC FLOW WHOLE ISLAND

20000
40000
60000
80000
100000
120000
140000

ALL FIGURES DENOTE MOTORISED VEHICLES PASSING IN BOTH DIRECTIONS PER WEEK IN AUGUST 1953.

SCALE OF MILES
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

MAP NO. 11

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

TRAFFIC FLOW - CENTRAL AREA

25000
50000
75000
100000
125000
150000
175000
200000
225000

ALL FIGURES DENOTE MOTORISED VEHICLES PASSING IN BOTH DIRECTIONS PER WEEK IN AUGUST 1953.

BOUNDARY OF CENTRAL PLANNING AREA

SCALE OF MILES
0 ¼ ½ ¾ 1 1¼ 1½

MAP NO. 12

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

COMMUNICATIONS

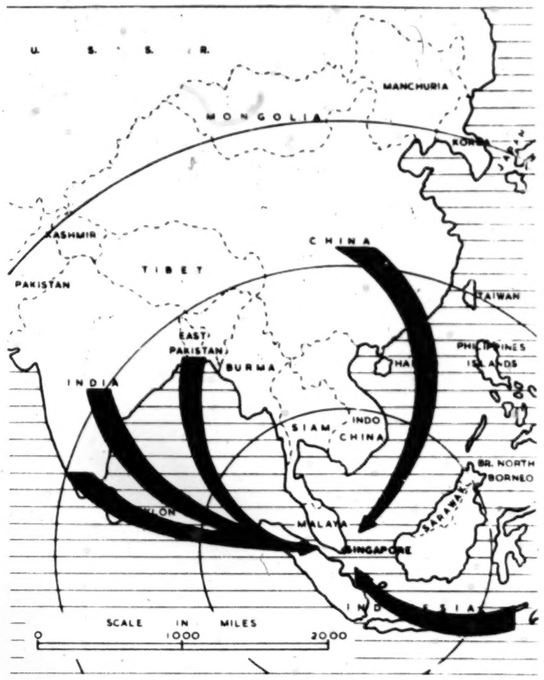
- BOUNDARY OF TOWN MAP AREA
- EXISTING MAJOR TRAFFIC ROUTES
- EXISTING MAIN THOROUGHFARES
- EXISTING RAILWAYS
- EXISTING HARBOUR AREA
- EXISTING AERODROME
- PROPOSED MAJOR TRAFFIC ROUTES
- PROPOSED AERODROME

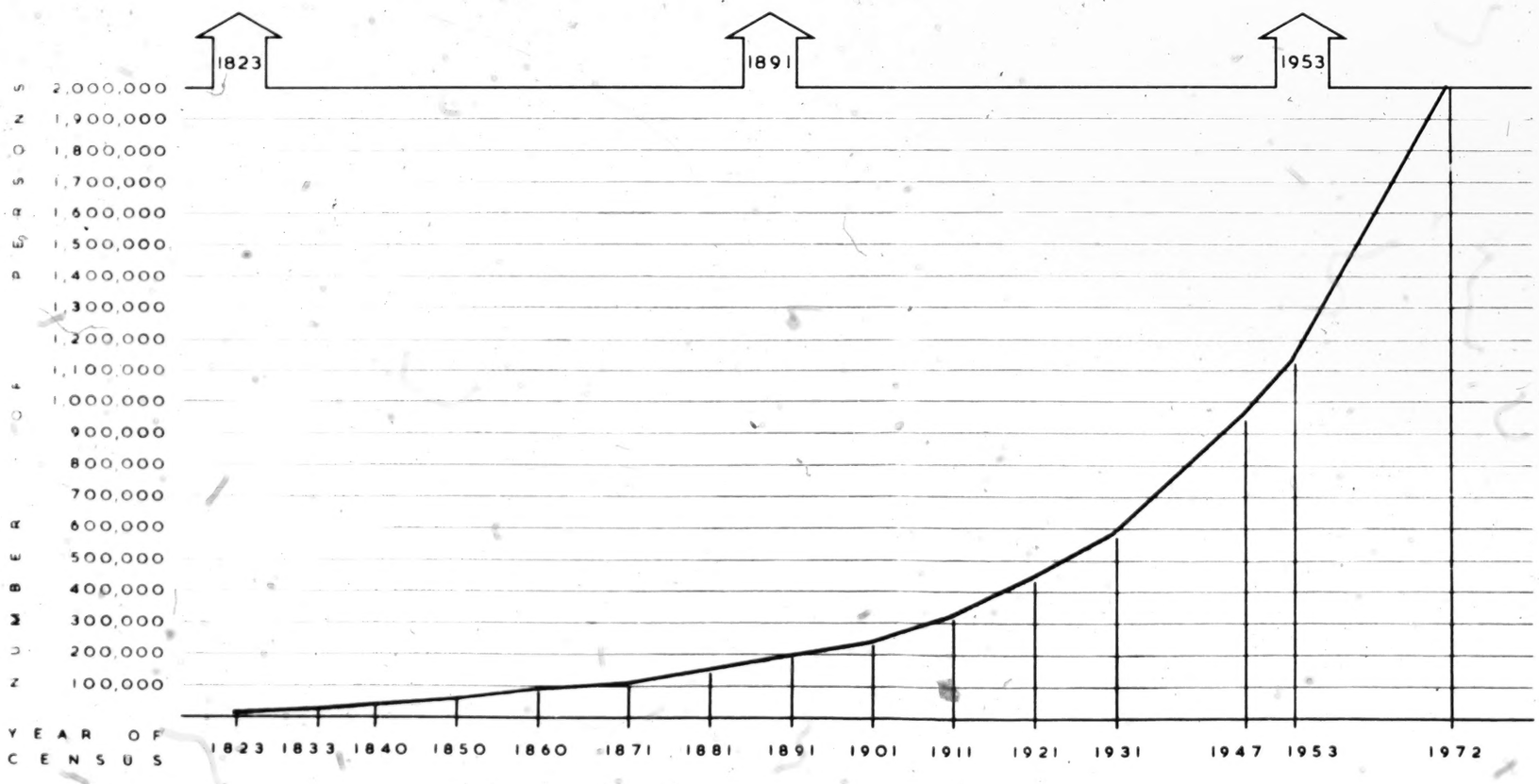
SCALE OF MILES

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

DIAGRAMS OF ETHNIC STRUCTURE AND ORIGIN

DIAGRAM I





GRAPH SHOWING POPULATION GROWTH

COLONY OF SINGAPORE

DIAGNOSTIC SURVEY AND MASTER PLAN

POPULATION

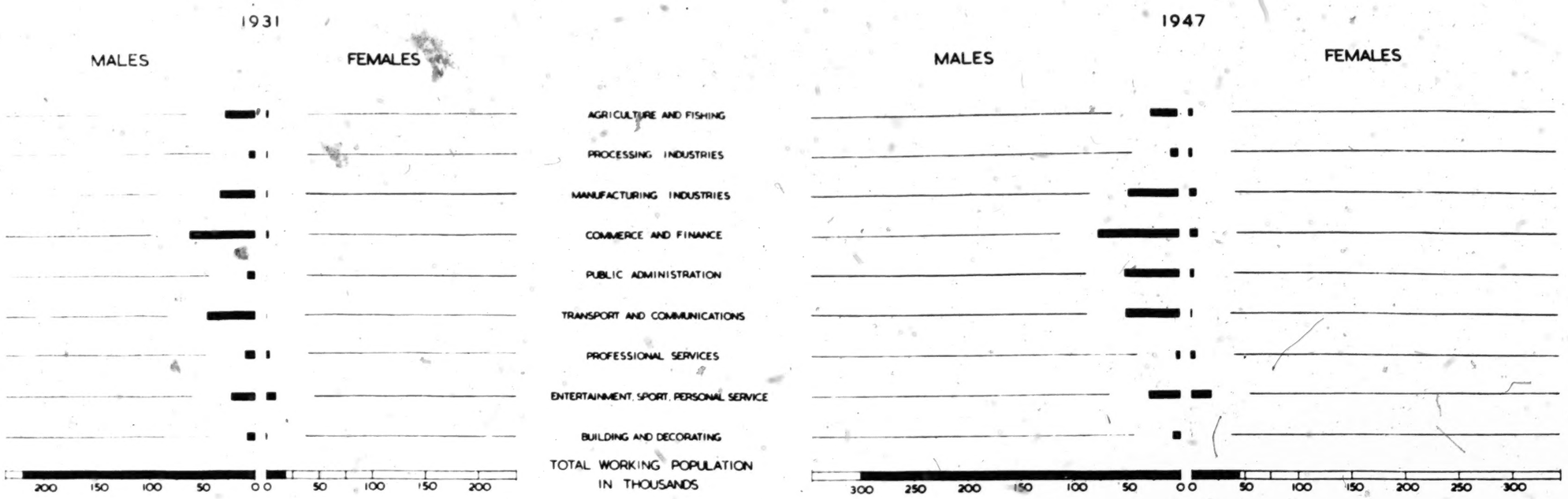
ORIGIN, GROWTH

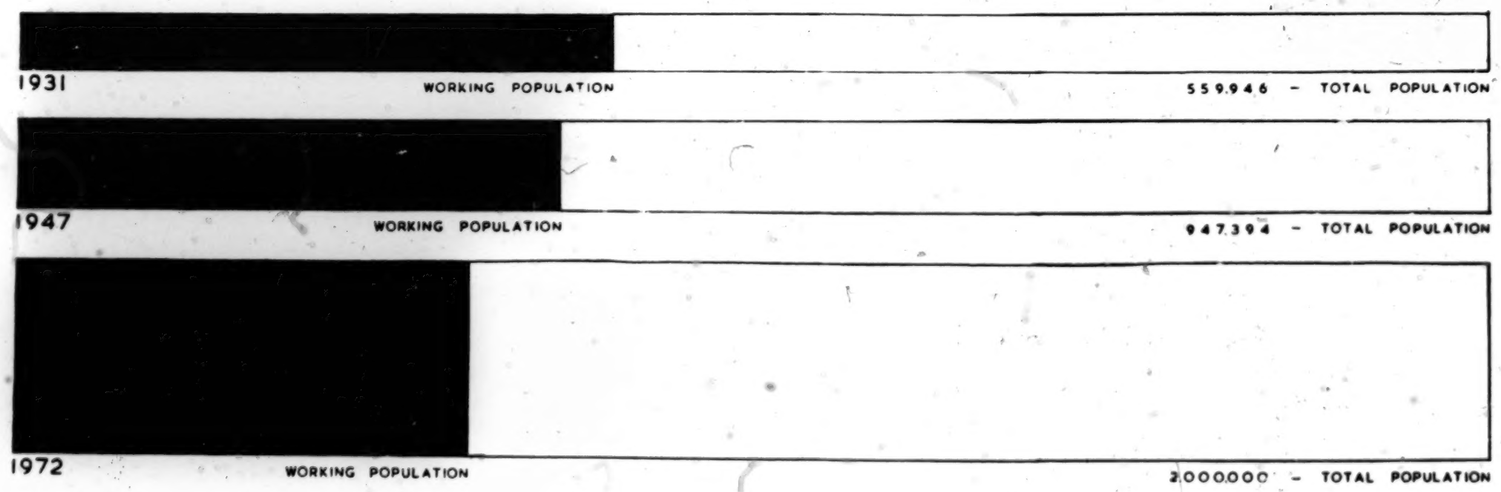
AND COMPOSITION

DATE: SEPTEMBER 1954

Diagram II

CHANGES IN EMPLOYMENT STRUCTURE 1931-1947.





COLONY OF SINGAPORE

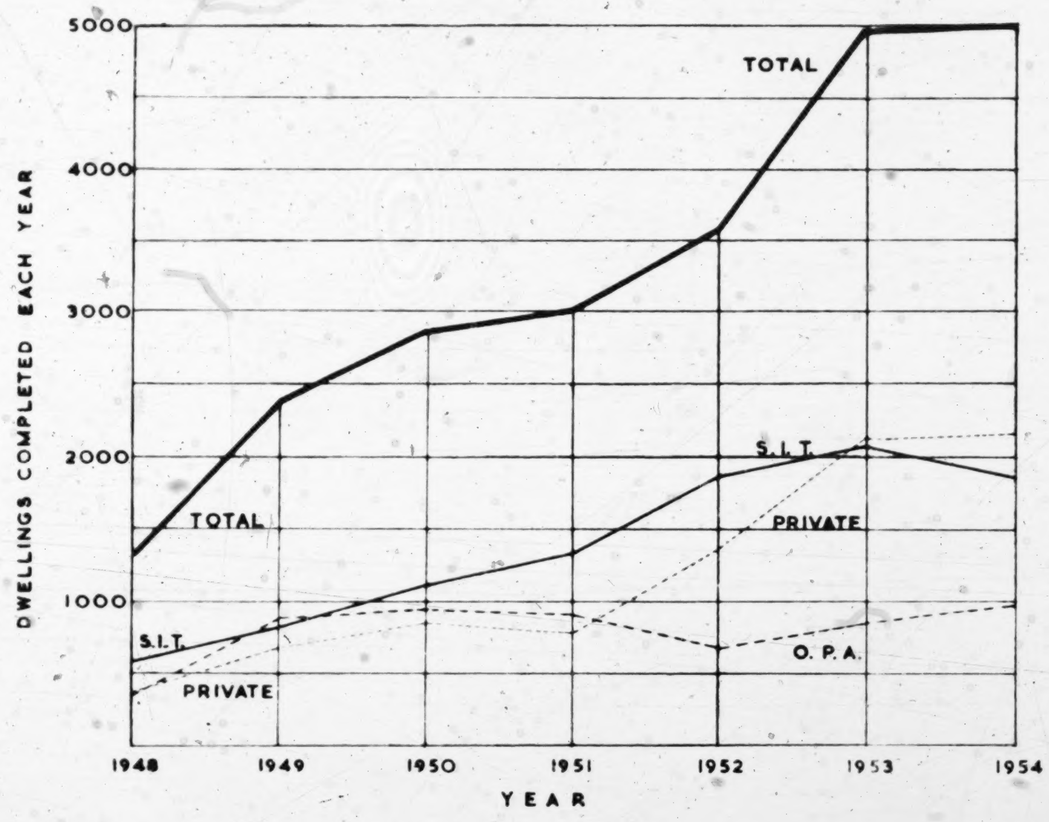
DIAGNOSTIC SURVEY AND MASTER PLAN

TRENDS IN INDUSTRIAL POPULATION

CHANGES IN WORKING POPULATION

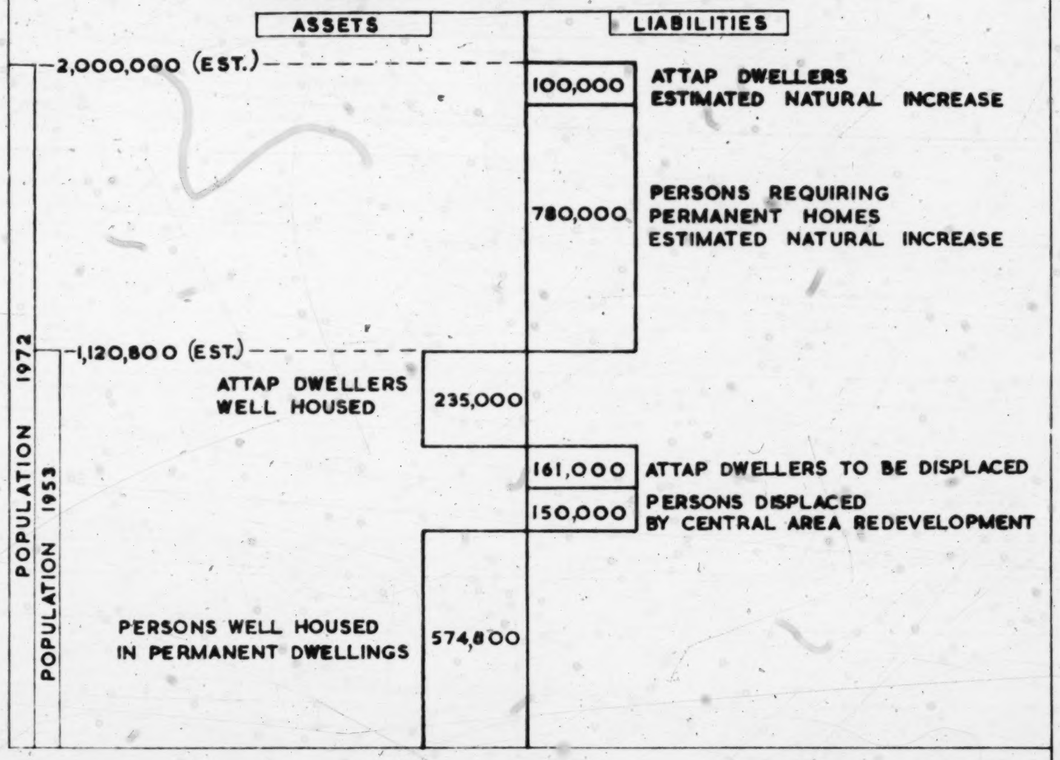
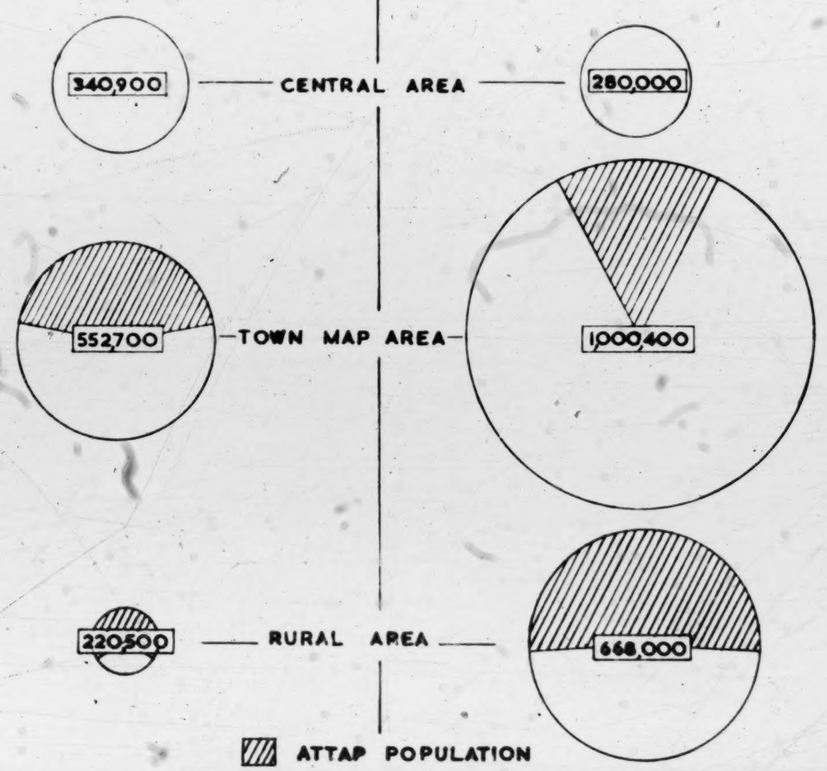
DATE SEPTEMBER 1954

EXISTING RATES OF PERMANENT HOUSING



AGENCY	DWELLINGS COMPLETED IN EACH YEAR						
	1948	1949	1950	1951	1952	1953	1954
PRIVATE ENTERPRISE	360	685	839	780	1486	2054	2161
S. I. T.	597	828	1102	1304	1886	2041	1872
OTHER PUBLIC AUTHORITIES	351	873	950	925	690	851	954
TOTAL	1308	2386	2891	3009	4062	4946	4987

HOUSING – 1953 TO 1972



DISTRIBUTION OF POPULATION